DSM44

Aiken Industries
California Instruments Division

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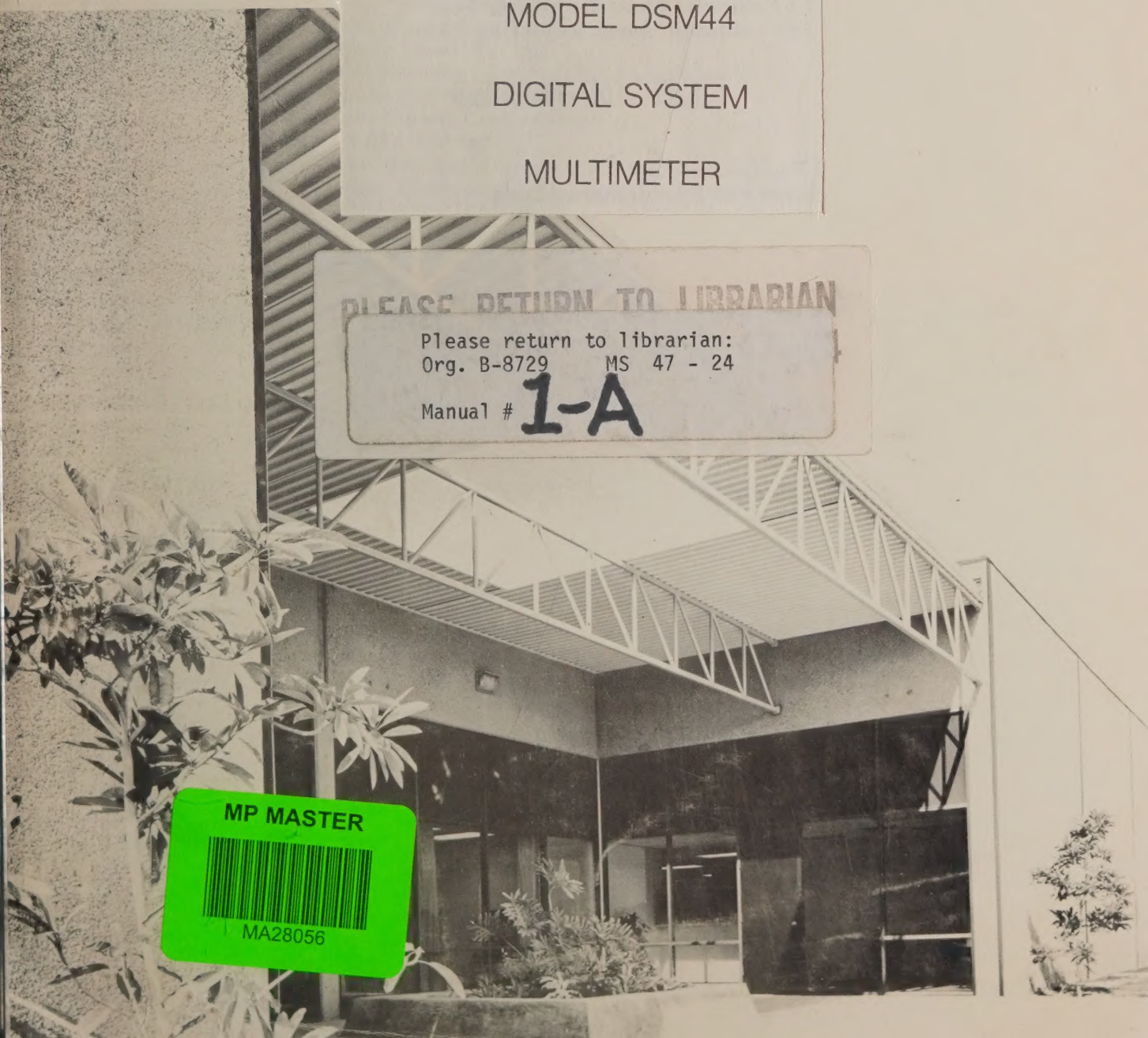
MODEL DSM44

DIGITAL SYSTEM

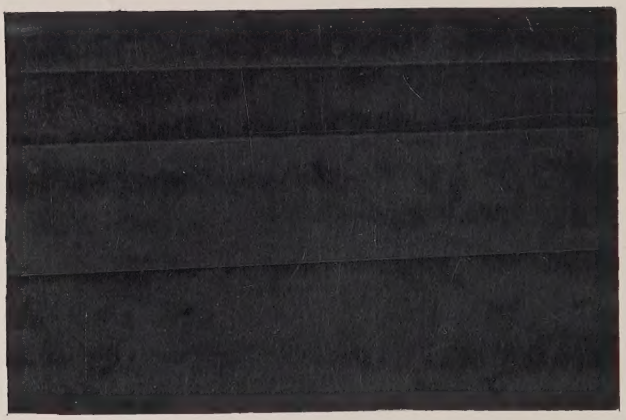
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MANUAL # 2

INSTRUCTION MANUAL

CIMRON®

MODEL DSM44

DIGITAL SYSTEM

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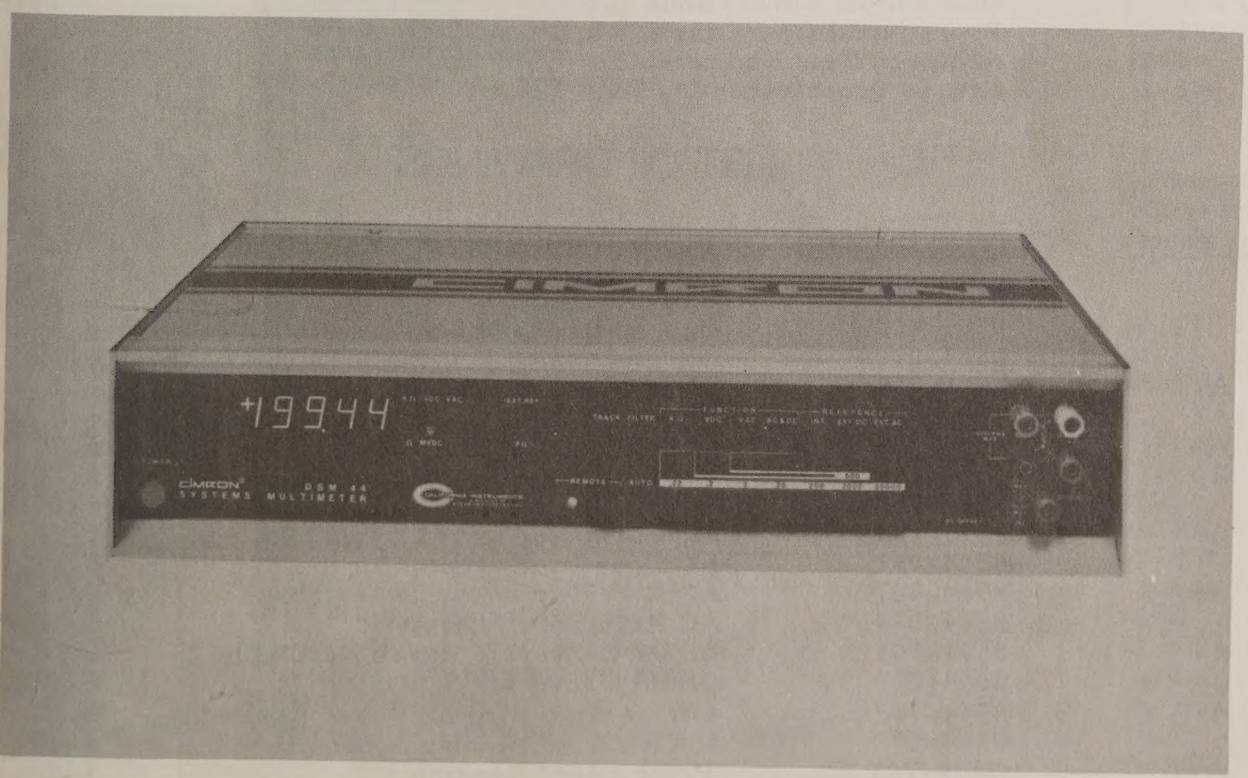


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SECTION I
DESCRIPTION

1-1 INTRODUCTION

1-2 This manual contains physical and functional descriptions, principles of operation, operating and maintenance instructions (including component location and schematic diagrams) and lists of replaceable parts for CIMRON® Model DSM 44 Digital Systems Multimeter, manufactured by CALIFORNIA INSTRUMENTS COMPANY, a division of AIKEN INDUSTRIES, INC.

1-3 FUNCTION

1-4 The CIMRON® Model DSM 44 is basically a solid state, semi-wireless DC Volt/Ratiometer with autoranging that, with plug-in options, can measure AC volts (average calibrated in RMS or True RMS), true 4 wire resistance, 4 wire DC Ratio and AC/AC Ratio.

1-5 PHYSICAL DESCRIPTION

1-6 The DSM 44 is designed primarily for system use but may be used as a bench instrument if desired. All basic controls are front panel mounted. Parallel connected sets of input terminals are mounted on front and rear panels. In each set, two terminals are provided for HI and LO input connections for DC and AC voltages. Two separate terminals are provided for the output of the OHMS Converter constant current source or the external DC or AC reference input. The fifth terminal connects to the guard shield of the analog section so it may be separately driven or tied to signal LO. None of the front panel controls or inputs extend beyond the housing and, are therefore, well protected against accidential damage.

1-7 OPTIONS

1-8 A number of optional accessories are avilable to extend the capability of the basic DSM 44. These are listed in Table 1-1.

1-9 This manual contains service information for the basic unit and all options except Option 02. Option 02, the True RMS Converter, is furnished with separate installation and service instructions.

1-10 SPECIFICATIONS AND PERFORMANCE DATA

1-11 Specifications and performance data for the Model DSM 44 are listed in Table 1-2.

TABLE 1-1 Optional Equipment List

ACCESSORY	OPTION NO.
Average Reading AC Signal Converter	01
True RMS AC Signal Converter	02
Average Reading AC Reference Converter	03*
True RMS AC Reference Converter	04*
4-Wire OHMS Converter	05
4-Wire Bipolar DC/DC Ratio	06
Isolated Data Output	07
Remote Control	08
ASCII Data Output and Remote Control Interface IEEE-488-1975	09
Signal and Ratio Input Cable Set for Front Input	10
50Hz Operation	11**

* Options 03 and 04 require factory installation.

** With Option 11 installed, all rebalance times increase 10 ms.

SPECIFICATIONS

TABLE 1-2 Specifications and Performance Data
(Specification for 90 days based on a resolution of 1 part in 20,000)

All Specifications apply when tested in accordance with standard California Instruments Test Procedures.

DC VOLTAGE MEASUREMENT

Ranges	200 mv, 2V, 20V, 200V, 500V
Accuracy (23°C ±5°C)	±(0.01% of reading +0.01% of full scale)
Temperature Coefficient	(0°C-18°C, 28°C-55°C)
All Ranges	±(0.001% of reading +0.001% of full scale) per °C
Input Offset Current	100 pico amps maximum at 23 °C
Input Impedance:	
200 mv and 2V ranges	1000 megohms
20V, 200V, 500V ranges	10 megohms
Common Mode Rejection:	Measured at DC and at 60Hz with a 1K unbalance
20 mv and 2V ranges	110 dB
20V and 200V ranges	80 dB
500V range	70 dB
Normal Model Rejection at 60Hz:	
Filter out	60 dB
Filter in	90 dB
Settling Plus Conversion Time (From simultaneous application of voltage and external start command, to Data Ready):	
Filter out	
20V range	150 ms
All Other Ranges	50 ms
Filter in	300 ms
Range Change Time:	
Filter out	
20V range	150 ms per range
All Other Ranges	50 ms per range
Filter in	300 ms per range
Overload Protection	700VDC or 500V RMS continuous, any range

DC RATIO - 3 wire

Ranges	.2, 2, 20, 200 and 500. To read as a ratio, move decimal 1 place to left.
Accuracy (23°C ±5°C)	±[0.01% of reading +0.02(10/Ref. V.)% of full scale]

External Reference Input Voltage	+1 to +11 V
External Reference Input Impedance	100 megohms at 10V
External Reference Overload Protection	±100VDC maximum
Common Mode Rejection	Same as DC
Normal Mode Rejection	Same as DC
Settling Plus Conversion Time	Same as DC

EXTERNAL DC REFERENCE, 4 WIRE AUTO BIPOLAR

Polarity	Displays algebraic sign of signal and reference
Accuracy (23°C ±5°C)	± [0.01% of reading +0.025(10/Ref. V.)% of full scale]
External Ref. Input Voltage (Reference input with respect to SIG input LO)	±14VDC at either reference input
Other Specifications	Same as 3 wire reference

AC VOLTAGE MEASUREMENT (Average reading calibrated in RMS)

Ranges	2V, 20V, 200V, 500V input. Volt-hertz product not to exceed 2×10^7
Accuracy (23°C ±5°C):	
40Hz to 20KHz	±(0.08% of reading +0.03% of full scale)
20KHz to 50KHz	±(0.4% of reading +0.02% of full scale)
Temperature Coefficient	(0°C-18°C, 28°C-55°C)
40Hz to 20KHz	±(0.003% of reading +0.002% of full scale) per °C
20KHz to 50KHz	±(0.007% of reading +0.002% of full scale) per °C
Input Impedance	
Front or Rear Inputs	1 megohm shunted by less than 100pF
Settling Time Plus Conversion Time (From simultaneous application of voltage and external start command, to Data Ready):	
Filter out (Frequency $\gtrsim$ 380Hz)	150 ms
Filter in (Frequency $\lesssim$ 380Hz)	300 ms

Range Change Time:		
Filter out	150 ms per range	
Filter in	300 ms per range	
Overload Protection	500V RMS continuous any range	

RESISTANCE MEASUREMENT

Ranges	.02K, .2K, 2K, 20K, 200K, 2000K, 20000K	
Test Current	10ma, 1ma, 1ma, 100μa, 10μa, 1μa, 100na	
Accuracy (23°C ±5°C):		
.02 through 200K ranges	±(0.02% of reading +0.01% of full scale)	
2000K range	±(0.05% of reading +0.01% of full scale)	
*20000K range	±(0.2% of reading +0.025% of full scale)	
Temperature Coefficient	(0°C-18°C, 28°C-55°C)	
.02K through 200K ranges	±(0.003% of reading +0.001% of full scale) per °C	
2000K range	±(0.005% of reading +0.001% of full scale) per °C	
20000K range	±(0.006% of reading +0.002% of full scale) per °C	
Settling Time Plus Conversion Time (From simultaneous application of unknown resistance and external start command, to Data Ready):		
.02K, .2K, 2K, 200K ranges	50 ms	NOTE: Settling times will be affected by cable insulation material and capacity. Low capacity teflon wire is recommended
20K and 2000K ranges	150 ms	
20000K range	300 ms	
Open Circuit Voltage	5V maximum	
Input Configuration	True four-wire	
Input Protection	700VDC or 500V RMS on any range (10KHz maximum). See caution after Par. 3-18.	

C/AC RATIO - 3 wire

Average Reading Calibrated in RMS	(Specifications apply when signal converter and reference converter are in same range and operating at same frequency between 40Hz and 10KHz.)
Reference Input Voltage Range	2, 20, 200, 500

*NOTE: In the Internal Track mode of operation the 20000K range specification is ±(0.4% of reading +0.025% of full scale)

Accuracy (23°C ±5°C)	± [0.08% of reading +0.04 $\left(\frac{0.5 \text{ Ref Range}}{\text{Ref Voltage}}\right)$% full scale]
Reference Input Voltage	5% to 55% of Ref Range (limited to 500V) ie: (.1V to 1.1V on 2V range) (5% to 60% on Ratios of 1:1 or less) Range displayed is that of signal converter
Reference Input Impedance Front or Rear Input	1 megohm shunted by less than 150pF
GENERAL	
Input	Floating and guarded with guard connection at front panel
Display	4-1/2 digit, 0.55 inch high, planar, gas discharge
Resolution	1 part in 20,000
Overload Indication	Blinking 10^s, 100^s and 1000's digits
False Program Indication	Blinking letter "F" in units digit
Maximum Input Voltage Without Damage	
DC	500V RMS in any range
AC	500V RMS in any range
OHMS	500V RMS in any range
External Reference AC	500V RMS in any range
External Reference DC	100V DC
Common Mode Voltage	500V DC
Conversion Rate	
Internal Normal	4 per second
Internal Track	20 per second
External Control	20 per second
Autorange Limits	
Uprange	20,000 counts
Downrange	< 1,800 counts
Data Output	1-2-4-8 BCD. TTL compatible. High true, parallel or serial by character in multiples of 4 bit bites

Remote Control	1-2-4-8 BCD. TTL compatible, low true. Parallel or serial character load with storage.
Input Power	115/230V RMS ±10% 50 to 440Hz. 26 watts maximum at 115V
Temperature Limits	
Operating	0 to 50°C
Storage	-40°C to 75°C
Humidity	0 to 80%, noncondensing at 23°C
Altitude	
Operating	0 to 10,000 feet
Nonoperating	0 to 50,000 feet
Size	3.5 inches high, 17 inches wide, and 15 inches deep
Weight	16 lbs approximately (depends upon options)

SECTION II

INSTALLATION AND INTERFACE

2-1 GENERAL

2-2 This section of the manual provides instructions for unpacking, inspection for in-shipment damage, pre-operational tests and mechanical installation of the Model DSM 44 Digital Systems Multimeter.

WARNING

This equipment is powered by and generates potentially lethal voltages.

DEATH

on contact may result if personnel fail to observe safety precautions. Do not touch electronic circuits when power is applied. Avoid contact with all input power connections, the high voltage supply or display modules. Verify that power supply voltages are discharged to safe levels after power turn-off before touching circuitry.

2-3 INITIAL INSPECTION IN CONTAINER

2-4 A visual inspection of the shipping container should be accomplished prior to acceptance from the carrier and if extensive damage to the shipping container is evident, a description of the damage should be noted on the carrier's receipt and signed by the carrier's agent.

2-5 UNPACKING

2-6 Each Model DSM 44 Digital Systems Multimeter is shipped in a cardboard container with protective inner packing, according to best commerical standards, and can be unpacked using standard procedures. Do not destroy the packing containers until the unit has been inspected for possible damage in shipment.

2-7 INITIAL INSPECTION

2-8 Visually inspect the Digital Multimeter for obvious mechanical damage, dents, broken controls, front and rear terminals and front panel breakage. If any damage is evident, notify the carrier. Do not return an instrument to the factory without prior approval.

2-9 POWER REQUIREMENTS

2-10 The CIMRON® Model DSM 44 Digital Systems Multimeter may be powered from a 48 to 420 Hz power line. The unit is normally set for operation from 105 to 125 volts RMS. Voltages above this limit may damage the instrument and voltages below this limit will result in below standard performance. The unit may also be operated from 210 to 250 volts RMS by resetting the power selector switch, A7S1, located adjacent to the power transformer, A7T1, on the power supply board at the left rear. The Multimeter requires approximately 26 watts from the AC line.

2-11 FUSE PROTECTION

2-12 The Digital Multimeter is protected by a single 1/2 ampere slo-blo fuse retained in a twist-out holder mounted in the rear panel of the instrument. A 3/10 ampere slo-blo fuse is used when the instrument is switched for 230 volt operation.

2-13 POWER INPUT WIRING

2-14 The Digital Multimeter is supplied with a conventional three pronged power input plug on the end of a six-foot cable and is used with 115 volt AC lines with a capacity of 1 ampere or greater. To operate the unit from a 230 volt source, it may be necessary to remove the plug and replace it with one compatible with the existing 230 volt receptacle.

2-15 PRELIMINARY CHECKS AND ADJUSTMENTS

2-16 Each Model DSM 44 Digital Systems Multimeter is carefully inspected and adjusted at the factory and should not normally require adjustment at time of installation, however, the following checks should be performed to verify functional operation. A list of required test equipment will be found in Table 5-1.

A description of the location and function of all front panel controls is provided in paragraph 3-4 of this publication.

CAUTION

The GUARD (GREEN) terminal must be terminated at all times to prevent inaccuracies and instrument damage. The GUARD may be driven independently, but it is generally sufficient to connect it to the BLACK terminal.

A. Connect the unit to the power source, turn on power by depressing the POWER switch and allow 30 minutes for warm up and stabilization.

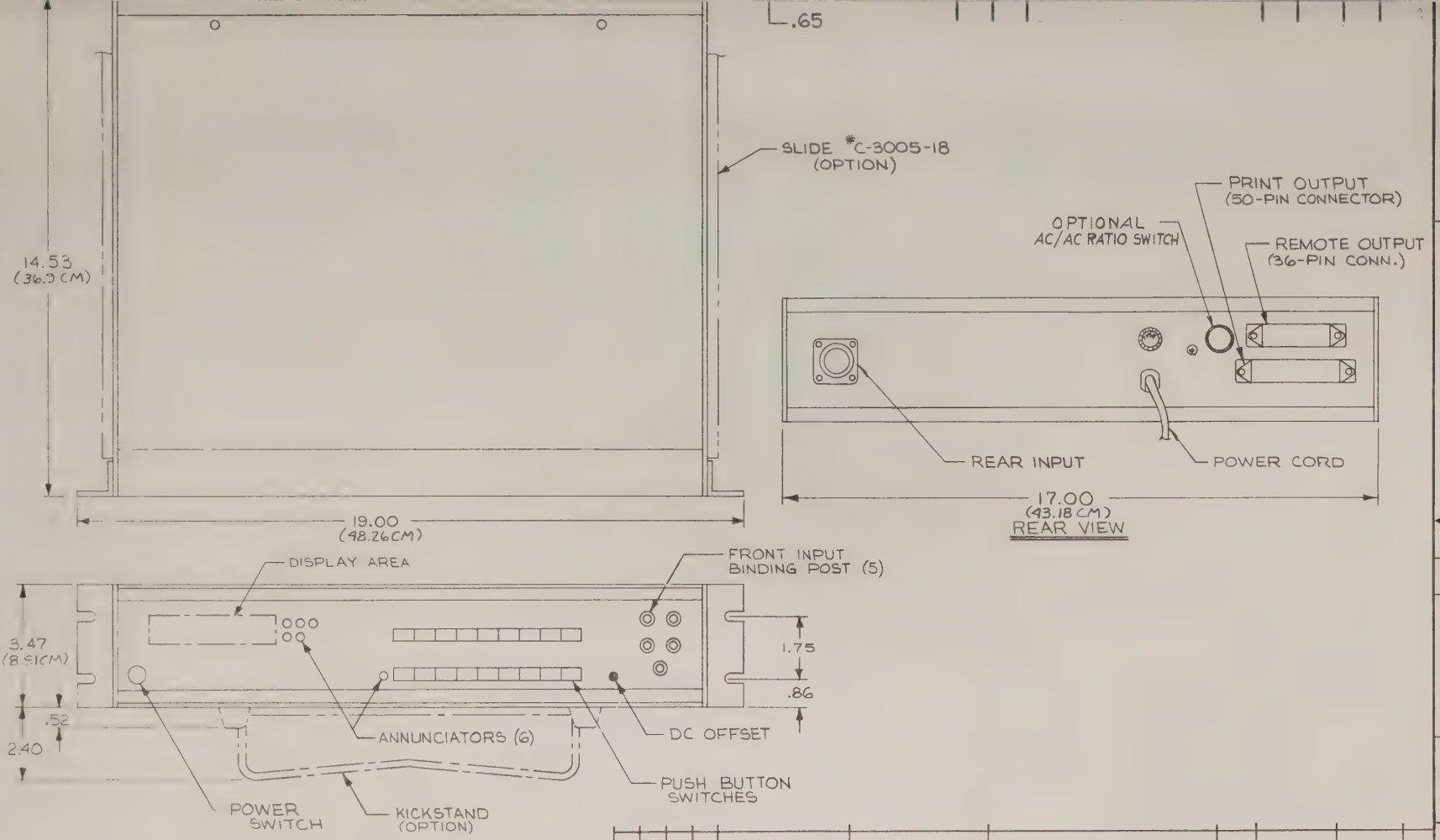
B. Short the input leads, select the DC function by depressing the DC switch button, place the unit in manual operation by selecting the 2 volt range. If the display does not read .0000, select the 200 mv range and adjust the OFFSET for a reading of 00.00. Return the unit to the 2 volt range and check for a reading of .0000.

C. Using a Cohu Model 351, or equivalent DC Standard, apply +1.0000 volt to the input of the instrument. The display should indicate +1.0000 ±3 digits.

D. If the AC Converter is installed, select the AC function by depressing the AC switch button and select the 2 volt range. Using a Hewlett Packard Model 745, or equivalent AC calibrator, apply 1.0000 volts RMS at 1 KHz to the input terminals. The display should read 1.0000 ±14 digits.

E. If the OHMS Converter is installed, select the OHMS function by depressing the Ω switch button and select the 2K range. Connect a 1K Ohm ±0.005% resistor to the input as shown on the diagram at the input terminals. The display should read 1.0000 ±4 digits.

Failure of the unit to operate within the limits set forth above, indicates the need for adjustment of the unit in accordance with calibration procedures detailed in Section V of this manual.



REQD PER ASSY	ITEM NO.	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES.	ZONE

DIM IN INCHES
TOLERANCES
.XXX = .010
.XX = .03
X° = 30'

BREAK ALL SHARP CORNERS & EDGES
MACH SURFACES ✓

DWG SIZE C

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TITLE
OUTLINE DRAWING
DIGITAL SYSTEM METER

CALIFORNIA INSTRUMENTS
a division of AIKEN INDUSTRIES INC.

MODEL DSM 44

RELEASE			
CHECKER		9/11/75	PURCHASING
DESIGN			PROJ ENGR
DRFTSMN	J CAMPBELL		CHF ENGR

CONTRACT NO.

CODE IDENT 16067

DWG NO. C8544-900 REV /

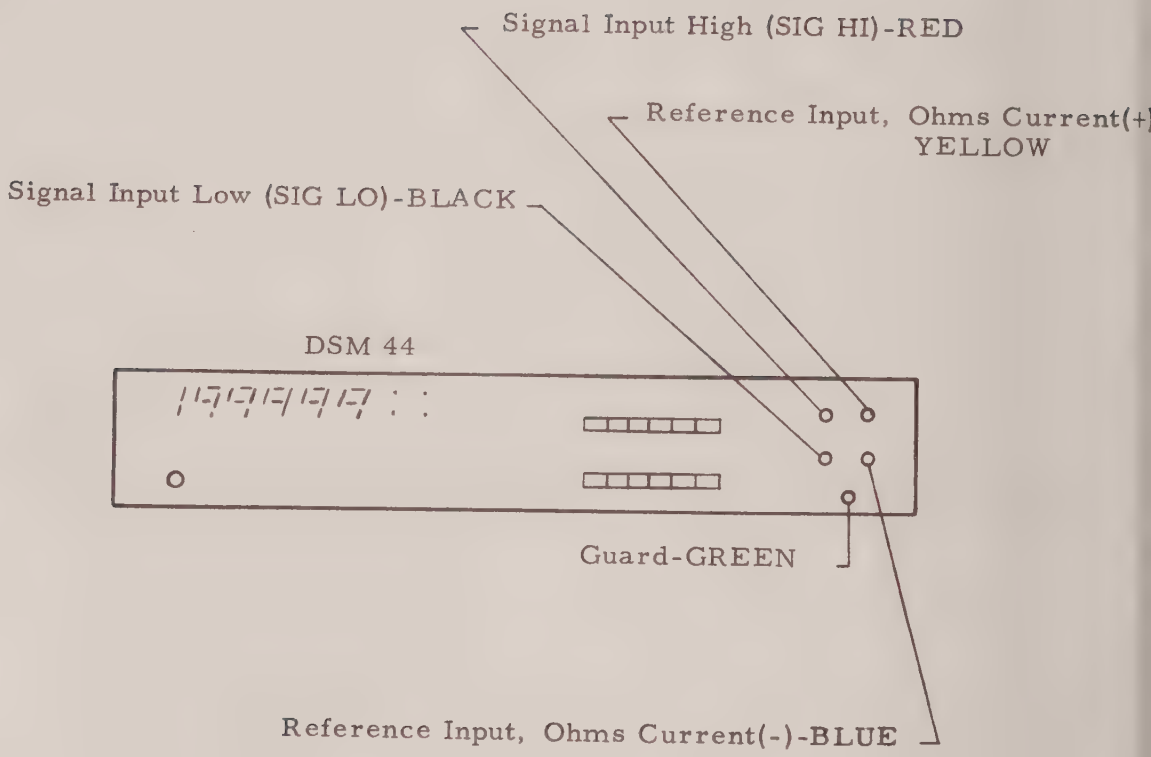
SCALE 1/2 SHEET 1 OF 1

DASH NO.	QTY REQD	NEXT ASSEMBLY	EFF ON	AUTH

NOTES: (UNLESS OTHERWISE SPECIFIED)

CALICO F-102

C8544-900 /



INPUT TERMINALS

FIGURE 2-2

2-17 MECHANICAL INSTALLATION

2-18 The CIMRON® Model DSM 44 Digital Systems Multimeter is designed for rack or bench mounting. Bench mounting requires no special considerations. Rack mounting requires that adequate clearance be provided between the Model DSM 44 and other equipment and that a free flow of air be available to maintain the temperature of the surrounding air at or below +50°C. Heat will have an adverse effect on any item of electronic equipment and useful life will be prolonged if lower temperatures are maintained. A dimensioned outline drawing of the DSM 44 Digital System Multimeter is shown in Figure 2-1.

2-19 INPUT SIGNAL CONNECTIONS

2-20 Five input terminals are provided on the front panel (see Figure 2-2). An input connector is also provided on the rear panel for connection to external voltages and resistances to be measured. For all AC and DC measurements, the input is connected to the INPUT HI and INPUT LO terminals (see Figure 3-1). When measuring high resistances where the resistance of connecting leads is not of importance, the blue (-) terminal may be connected to the black (INPUT LO) terminal and the yellow (+) terminal connected to the red (INPUT HI) terminal with straps or short leads (see Figure 3-2). The test leads are then connected to the red and black terminals. When low resistances are to be measured, the four wire system is used (see Figure 3-3). A lead from the yellow (+) terminal is applied to the unknown resistance and a lead from the red (HI INPUT) terminal is applied to the same point. Straps between these terminals are removed, of course. Likewise a lead from the blue (-) terminal is applied to the same point as the lead from the black (LO INPUT) terminal. Since the test current is not flowing in the leads connecting the resistors to the input of the voltmeter section of the instrument, the resistance of those leads will have no effect on the reading. Also, since the current flowing between the blue and yellow terminals is constant, irrespective of total circuit resistance, the voltage drop across the resistor will be a true measure of its resistance which will be measured by the voltmeter section of the instrument. The rear panel connector is wired in parallel with the front panel terminals and the connections to external signals and resistances are made in the same manner as those to the front panel terminals.

2-21 REMOTE CONTROL

2-22 Table 2-1 lists the connections to the rear panel remote control connector J26 with the signals that appear thereon. Internally, these connect to the Remote Board which serves as an interface between the DSM 44 and the remote equipment. The control lines become operative when the remote switch is depressed or if a priority remote signal brings J26, pin 18 to a logic low.

TABLE 2-1. Remote Connections J26

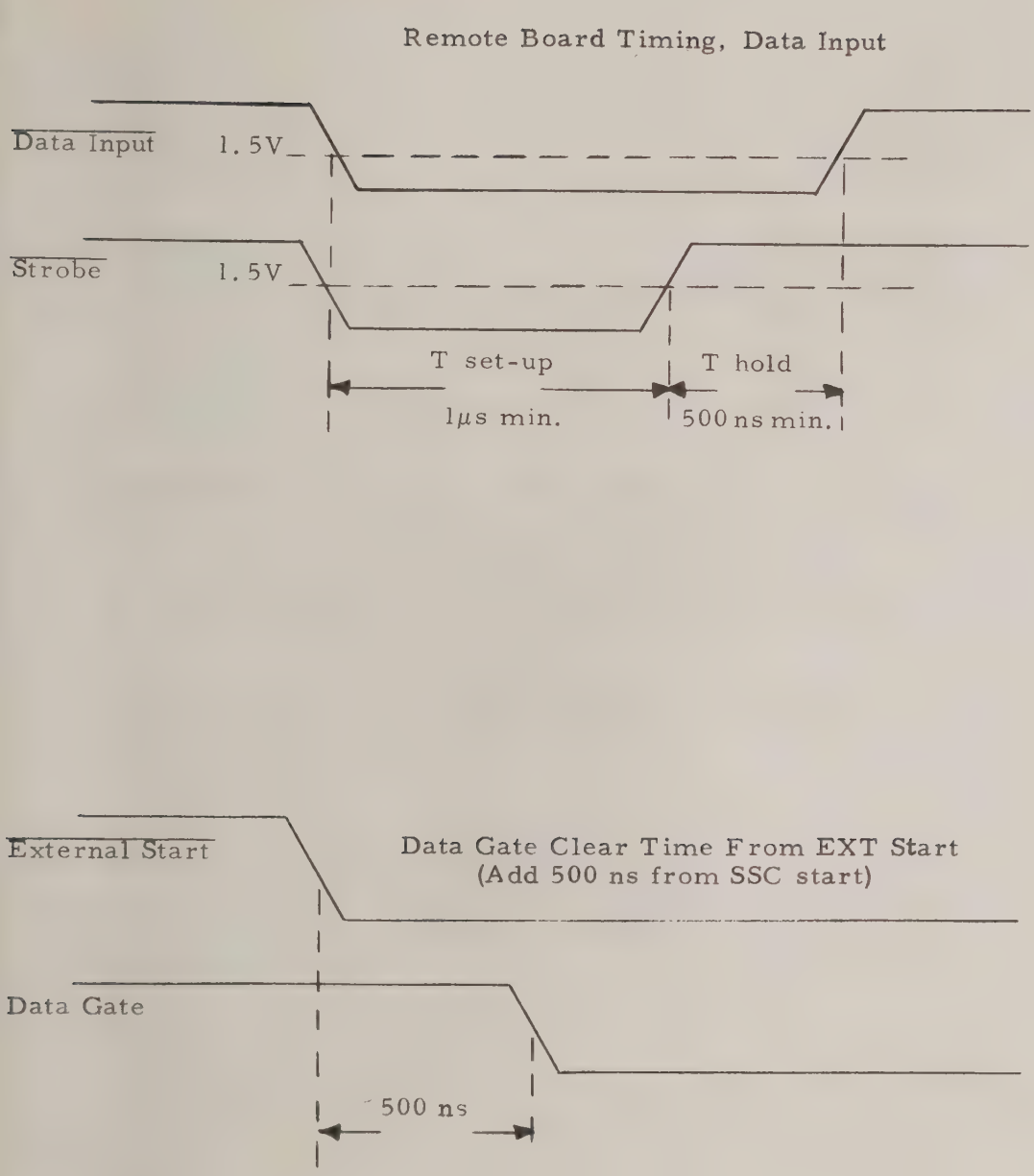
1.	Common		19.	N/C	
2.	Common		20.	$\overline{\text{Track}}$	(D)
3.	Remote Flag	*	21.	$\overline{\text{ESC}}$	(D)
4.	N/C		22.	$\overline{\text{Delay Inhibit}}$	(E)
5.	A Strobe		23.	$\overline{\text{FIL}}$	(E)
6.	$\overline{\text{RNG c}}$	(A)	24.	$\overline{\text{E Strobe}}$	
7.	$\overline{\text{RNG b}}$	(A)	25.	$\overline{\text{External Start}}$	
8.	$\overline{\text{RNG a}}$	(A)	26.	$\overline{\text{FUN a}}$	(B)
9.	$\overline{\text{D Strobe}}$		27.	$\overline{\text{AIS}}$	(B)
10.	N/C		28.	$\overline{\text{FUN c}}$	(B)
11.	+5V at 50 ma max.		29.	$\overline{\text{FUN b}}$	(B)
12.	N/C		30.	$\overline{\text{B Strobe}}$	
13.	Ref a (DC EXT)	(C)	31.	$\overline{\text{EDI}}$	
14.	$\overline{\text{C Strobe}}$		32.	$\overline{\text{Master Strobe}}$	
15.	Ref b (AC EXT)	(C)	33.	N/C	
16.	$\overline{\text{SSC}}$	(D)	34.	Data Gate	*
17.	$\overline{\text{EDL Enable}}$	(D)	35.	$\overline{\text{Binary Gate}}$	*
18.	$\overline{\text{PRI REM}}$ (Not stored)		36.	Binary Count	*

(All inputs must sink 4ma min.)

* Outputs (sink 10ma, source 300μa)
The letter in parentheses indicates the strobe that has control.

Definitions:

AIS : Active input switch
EDL : External Data Latching
ESC : External Start Control (Internal Start Inhibit)
SSC : Strobe Start Control
PRI REM : Priority Remote (overrides front panel local/remote switch)



Timing, Data Input and External Start

FIGURE 2-3

Table 2-2

Remote Program/Data Output

Range Code

Faulty Program	c	b	a	
Delay Inhibit, Track	0	0	0	Autorange
AC, DC	0	0	1	.02 KΩ
	0	1	0	.2 KΩ/.2V
	0	1	1	2 KΩ/2V
	1	0	0	20 KΩ/20V
	1	0	1	200 KΩ/200V
	1	1	0	2000 KΩ/500V
AC, DC	1	1	1	20,000 KΩ

Function Code

c	b	a	
0	0	0	Open Input
0	0	1	DC
0	1	0	AC
0	1	1	AC and DC
1	0	0	KΩ
1	0	1	Faulty Program
1	1	0	Faulty Program
1	1	1	Faulty Program

Reference Code

b	a	
0	0	Internal
0	1	(External DC)
1	0	(External AC)
1	1	Faulty Program

NOTE: 1. The range code is in ohms or mv, and the range print-out is the exponent. Example: Range 4 is printed. This is $1 \times 10^4 \Omega$ (10 KΩ) or 1×10^4 MV (10V).

2. The range displayed in AC external reference is that of the signal converter.

2-23 INPUT STORAGE

2-24 The Remote Board has provisions for storage of all modes of operation. Storage is controlled by the use of A, B, C, D and E strobes. The Remote Board may be used as a parallel input board without storage by installing a jumper between pad E8 and E9. It may also be used as a parallel load with storage by presenting the data in parallel and actuating the master strobe. The data can then be removed.

2-25 A low-going 1 MS pulse on J26-5, $\overline{\text{A STROBE}}$, will cause the range information on pins 6, 7 and 8 of J26 - $\overline{\text{RNG c}}$, $\overline{\text{RNG b}}$, $\overline{\text{RNG a}}$ - to be stored by the DSM 44. See Figure 2-3 for the required timing relationships.

2-26 The $\overline{\text{B STROBE}}$ input to the Remote Control Board (J26-30) allows the function and AIS information to be stored by the DSM 44. See Figure 2-3 for the required timing relationships.

2-27 The $\overline{\text{C STROBE}}$ control line (J26-14) controls the storage of reference information DC EXT and AC EXT present on pins 13 (Ref a) and 15 (Ref b) of J26. See Figure 2-3 for the required timing relationships.

2-28 The $\overline{\text{D STROBE}}$ (J26-9) allows storage of the TRACK, ESC, SSC and EDL modes of operation.

2-29 The $\overline{\text{E STROBE}}$ (J26-24) controls the storage of filter and delay inhibit on J26-23 ($\overline{\text{FIL}}$) and J26-22 ($\overline{\text{Delay Inhibit}}$) respectively.

2-30 RANGE CONTROL

2-31 The DSM 44 range is programmed on J26 pins 6, 7 and 8 when either $\overline{\text{PRI REM}}$ is programmed or the REMOTE button on the front panel is depressed. The range information is recognized in a LOW-true form. For example, to program the .2 range, pin 6 ($\overline{\text{RNG c}}$) and pin 8 ($\overline{\text{RNG a}}$) must be HIGH while pin 7 ($\overline{\text{RNG b}}$) must be pulled LOW. Additional range codes are given in Table 2-2.

2-32 REFERENCE CONTROL

2-33 Reference information is programmed on pins 13 and 15 of J26. Refer to paragraphs 3-19, 3-21 and 3-22 for a detailed description of the different reference modes of operation.

2-34 STROBE START CONTROL (SSC)

2-35 The $\overline{\text{SSC}}$ control line (J26-16) is used to select several different ways of initiating a new conversion. When the line is HIGH, the DSM 44 will initiate a new conversion in the conventional manner - refer to paragraph 2-42. When $\overline{\text{SSC}}$ is low, the instrument may be triggered by the Master Strobe, A STROBE, or B STROBE.

By programming SSC, the instrument is programmed to start upon the initiation of a range program (A STROBE) or a function program (B STROBE). All settling delays should be enabled - refer to paragraph 2-41 - to prevent a reading error when this mode of operation is used.

FUNCTION	DELAY	CHANGE
DC	100ms	From any range or function to the DC function and the 20 range.
	0	From any range or function to the DC function and other ranges.
AC TRUE RMS AC	250ms 400 ms	From any range or function to the AC function
KΩ	250 (W/O TRMS) 400 (RMS)	From any range or function to the ohms function and the 20,000 KΩ range.
KΩ	100ms	From any range or function to the ohms function and the 20 KΩ or 2000 KΩranges.
KΩ	0	From any range or function to the ohms function and all other ranges.
FILTER	250 (W/O TRMS) 400 (TRMS)	From in any range, function or input signal.

Steeling Time Delays

TABLE 2-3

2-36 EXTERNAL DATA LATCH ENABLE (EDL ENABLE)

2-37 At the end of each instrument conversion all numerical and instrument status data is normally transferred to the data output stroage register and presented to the data output connector J23. If the EDL ENABLE line - J26-17 - is programmed LOW, the normal data storage in the output storage registers is prevented until a LOW-going 1 MS pulse is presented to J26 pin 31 (EDL). When this mode of operation is programmed, two sets of data are stored in the instrument, data from a previous conversion stored in the output registers, and data from the last conversion stored internally in the instrument. EDL is not a compatible feature when autorange is programmed.

2-38 PRIORITY REMOTE

2-39 When J26 pin 18 (PRI REM) is programmed LOW, all instrument functions normally controlled at the front panel are preempted by the programming on the Remote Connector J26. The Priority Remote mode of operation is the only instrument mode of operation not capable of being stored on the Remote Board.

2-40 TRACK

2-41 The TRACK mode of operation (J26 pin 20 LOW) automatically disables all internal program delays to allow the instrument to run at its maximum rate of 20 to 30 readings per second. In this mode of operation, the DATA GATE cannot be used to indicate the end of conversion. Instead, the data must be taken within 30 MS of a transition to a HIGH level on J26 pin 35 (BINARY GATE). Refer to paragraph 2-58.

2-42 EXTERNAL START CONTROL

2-43 To externally control the reading rate of the instrument, J26 pin 21 (ESC) must be programmed LOW. With this mode of operation programmed the internal sample rate generation is disabled allowing the instrument to initiate a new conversion each time J26 pin 25 is programmed LOW.

The operation of the EXTERNAL START and the DATA GATE line should be gated. An external start should only be initiated when the DATA GATE (J23 pin 49) is HIGH. When ESC is HIGH, the instrument will operate at a normal rate of four conversions per second or 20 per second in the TRACK mode.

2-44 DELAY INHIBIT

2-45 Function and range relays in various sections of the instrument have an inherent delay from the time of activation to the time they are in a stable state. This period of time is called settling time. In addition to relay settling time, the ohm converter and instrument filter need additional settling time due to their inherent RC characteristics. In the normal instrument operating mode all settling times are automatically accounted for by an internal delay that begins when the instrument is given a start command. The actual conversion occurs only after the delay has timed-out. J26 pin 22 is the DELAY INHIBIT control line. When this line or TRACK is programmed LOW, all instrument dealys are inhibited. This mode of operation is generally useful when repeated high speed conversions are needed in a fixed range and function without filter. Since the delay times may be externally generated by the user, Table 2-3 lists the delays necessary to prevent first reading inaccuracies when changing ranges and/or functions.

2-46 FILTER

2-47 The instrument filter is programmed by a LOW on J26 pin 23 (FIL). The filter is automatically programmed in the AC function with the TRMS converter installed. The filter cannot be programmed in any ranges of the ohms function.

2-48 EXTERNAL START

2-49 When ESC is programmed - refer to paragraph 2-39 - the instrument will start on the falling edge of a pulse applied to J26 pin 25 (EXTERNAL START). Refer to Figure 2-3 for the timing relationship of EXTERNAL START and DATA GATE. The external start pulse should last for a minimum of 1 msec and should not recur before the end of conversion (DATA GATE). Re-application of an external start command will reset the machine - without DATA GATE - and start a new conversion cycle.

2-50 FUNCTION CONTROL

2-51 The desired instrument function is programmed on J26 pins 26, 28 and 29 when either PRI REM is programmed or the REMOTE button is depressed on the front panel. The function information is recognized in a LOW true form. To program AC, pin 26 (FUN a) and pin 28 (FUN c) must be HIGH while pin 29 (FUN b) must be pulled LOW. Additional function codes are given in Table 2-2

2-52 EXTERNAL DATA LATCH (EDL)

2-53 When the EDL ENABLE line is programmed, all range, function and numerical data is updated at the data output terminals of J23 with the application of a LOW-going 1 MS pulse on J26 pin 31 (EDL). Refer to paragraph 2-36.

2-54 MASTER STROBE

2-55 A LOW Going 1 MS pulse on J26 pin 32 (MASTER STROBE) will cause a simulatneous operation of all strobes, A, B, C, D and E. Refer to the applicable paragraph for the effect of each strobe.

2-56 DATA GATE

2-57 When the instrument has completed a conversion or a faulty program has been generated, J26 pin 34 will go to a HIGH level. This line will stay HIGH until the faulty program is removed and the instrument is started from an external start command or until the internal sample rate generator restarts the instrument.

2-58 BINARY GATE

2-59 During the reference integration period of the conversion cycle (ER), the instrument counters accumulate a number of clock pulses. This count is equal to the unscaled magnitude of the quantity being measured. The BINARY GATE signal at J26 pin 35 is LOW during this counting period. By using external gating, binary counters can be used to accumulate clock pulses from J26 pin 36 (BINARY COUNT). There will be an 80 MS delay from the time pin 35 goes LOW until the first count. The maximum gate time is 16.74 M

2-60 DATA OUTPUT

2-61 The DSM 44 Print Board can be operated in one of 3 modes.

1. Parallel output data latched, but not inhibited during conversion.

2. Parallel output data inhibited during conversion.

3. Serial-by-character output in multiples of 4-bit bites.

2-62 To output parallel with data not inhibited during conversion, simply connect to the proper data lines and start print when Data Gate comes true.

2-63 To print parallel with data inhibited during conversion, connect to proper data lines and connect Pin 49 (Data Gate) to Pin 27 (master data inhibit) and print when Data Gate comes true.

2-64 To output serial-by-character, bus the data lines as desired and hold the A through H inhibit lines low. When data from a given character is desired, raise the proper inhibit line to a high until the data is transferred, then return it to a low. Continue this process until all characters have been transferred.

2-65 If the data output board is being used without the remote board installed, jumper 57 to 58 and jumper 66 to 67 on main board must be installed. J23 Pin 25 should be shorted to Pin 1 in the mating connector to inhibit the internal start. The instrument will now start on the rising edge of START (J23 Pin 50).

2-66 All outputs are latched prior to Data Gate and will not change with program change. Thus if the DSM 44 is started on a new program, it will hold the previous data until the strobe at the end of the new conversion. Note: (See EDL function on Remote board for extended capability in this area).

2-67 If an Improper Program combination occurs, the Data Gate will be immediately set and the DSM 44 will open all inputs and lock up until the False Program is cleared.

2-68 Care should be taken when connecting both Data Output and Remote Control into a system. The commons for both boards are internally connected and if both are used to connect to a system, a ground loop may occur.

2-69 Refer to Table 2-4 for connections to data output connector J23.

2-70 DATA GATE

2-71 The $\overline{\text{DATA GATE}}$ line, J23 Pin 39, has the same logic as the DATA GATE line available on the remote board. When the print board is not installed, the jumper from 57 to 58 is installed in the DSM 44 digital section (See Figure 4-2). With this jumper installed, J23 Pin 39 will have the same logic as the $\overline{\text{DATA GATE}}$ line, but it will not remain high with a faulty program.

2-72 FAULTY PROGRAM

2-73 The FAULTY PROGRAM line, J23 Pin 11, will go HIGH for the condition listed in Table 2-2. Refer to paragraph 4-70.

2-74 MASTER DATA INHIBIT and INHIBIT

2-75 Refer to paragraph 4-110.

Table 2-4

Data Output Connections J23

J23 PIN #			J23 PIN #		
1	Common		26	N/C	
2	Common		27	Master Data Inhibit	
3	1Ka	(B)	28	Function a	(H)
4	1Kb	(B)	29	Function c	(H)
5	1Kc	(B)	30	Function b	(H)
6	1Kd	(B)	31	100d	(C)
7	G Inhibit		32	100c	(C)
8	C Inhibit		33	100b	(C)
9	B Inhibit		34	100a	(C)
10	A Inhibit		35	Filter	(G)
11	Faulty Program	(A)	36	Ref a (DC EXT)	(G)
12	- Polarity (DC only)	(A)	37	TRACK	(G)
13	Overload (over 19999)	(A)	38	Ref b (AC EXT)	(G)
14	10K1	(A)	39	Data Gate	
15	H Inhibit		40	N/C	
16	F Inhibit		41	N/C	
17	10b	(D)	42	N/C	
18	10c	(D)	43	E Inhibit	
19	10a	(D)	44	D Inhibit	
20	10d	(D)	45	Units d	(E)
21	RNG c	(F)	46	Units b	(E)
22	N/C		47	Units a	(E)
23	RNG b	(F)	48	Units c	(E)
24	RNG a	(F)	49	Data Gate	
25	Int Start Inhibit		50	START	

Note: Letter in parentheses indicates which inhibit line controls that given line.
All Inhibit lines must sink 2ma min.
All output lines will sink 40ma except Data Gate which is limited to 10ma.

SECTION III

OPERATION

3-1 GENERAL

3-2 This section of the manual provides instructions for use and operation of each control and front panel adjustment, connections to external circuits and operation from remote locations.

3-3 FRONT PANEL OPERATING CONTROLS AND INDICATORS

3-4 The front panel operating controls and indicators are shown in the photograph on the cover page and are described in Table 3-1.

Table 3-1 Control and Indicator Functions

CONTROL/ INDICATOR	POSITION	FUNCTION	LOCATION
POWER	PUSH FOR ON/ PUSH FOR OFF	Switches on AC input power	Red button at lower left on front panel
REMOTE	PUSH FOR REMOTE/ PUSH FOR LOCAL	Transfers control to rear panel remote input only if remote board is installed	Left hand button in lower row
REMOTE ANNUNCIATOR		Lights when unit is under remote control	To left of bottom row of switches
AUTO	PUSH FOR AUTO	Selects Auto Range operation	Second from left in bottom row
.02	PUSH FOR .02 RANGE	Selects 20Ω Range when in ohms	Third from left in bottom row
.2	PUSH FOR .2 RANGE	Selects 200Ω Range in ohms and 200mv Range in DC	Fourth from left in bottom row
2	PUSH FOR 2 RANGE	Selects 2K Range in ohms and 2V Range in AC and DC	Fifth from left in bottom row
20	PUSH FOR 20 RANGE	Selects 20K Range in ohms and 20V Range in AC and DC	Sixth from left in bottom row
200	PUSH FOR 200 RANGE	Selects 200K Range in ohms and 200V Range in AC and DC	Seventh from left in bottom row
500/2000	PUSH FOR 500/2000 RANGE	Selects 2 megohm Range in ohms and the 500V Range in AC and DC	Eighth from left in bottom row

Table 3-1 Control and Indicator Functions (Con't.)

CONTROL/ INDICATOR	POSITION	FUNCTION	LOCATION
20,000	PUSH FOR 20,000 RANGE	Selects 20 megohm range in ohms	Right end button in bottom row
DC OFFSET	ADJUST-ABLE	Provides compensation for thermal drift between input leads and autozeroed input circuits.	To right of lower row of pushbuttons
DISPLAY		Displays value of input connected to input leads. Displays polarity in DC mode.	Upper left of panel
KΩ ANNUNCIATOR		Lights when in KΩ and in 1K or higher range	To right of display
Ω ANNUNCIATOR		Lights when in 20 or 200 ohm ranges	Under KΩ annunciator
VDC ANNUNCIATOR		Lights when display is indicating volts DC	To right of display
MVDC ANNUNCIATOR		Lights when display is indicating MVDC	Under VDC annunciator
VAC ANNUNCIATOR		Lights when display is indicating VAC	To right of display
EXT REF ANNUNCIATOR		Lights when internal reference is disabled and an external ref input is programmed	To left of upper row of pushbuttons
FILTER ANNUNCIATOR		Lights when filter is operating	Below external ref annunciator
TRACK	PUSH FOR ON/PUSH FOR OFF	When on, causes instrument to speed up from 4 readings per sec to 20-30 per second	Left pushbutton in upper row
FILTER	PUSH FOR ON/PUSH FOR OFF	Programs filter except in ohms	Second pushbutton from left in upper row
KΩ	PUSH FOR KΩ	Instrument measures resistance when button is depressed and ohms converter is installed. Button is interlocked and will release when another function is selected	Third pushbutton from left in upper row

Table 3-1 Control and Indicator Functions (Cont't.)

CONTROL/ INDICATOR	POSITION	FUNCTION	LOCATION
VDC	PUSH FOR DC	Instrument measures DC voltage when button is depressed. Button is interlocked and will release when another function is selected	Fourth pushbutton from left in upper row
VAC	PUSH FOR AC	Instrument measures AC voltage when button is depressed and AC converter is installed. Button is interlocked and will release when another function is selected. This button is used for either type AC converter	Center pushbutton in upper row
AC and DC	PUSH FOR AC and DC	Instrument measures combined value of AC voltage superimposed on DC voltage when button is depressed and True RMS converter is installed button is interlocked and will release when another function is depressed	Fourth pushbutton from right in upper row
INT	PUSH FOR INTERNAL REFERENCE	Instrument uses internal precision reference for all measurements. Button is interlocked and will release when another reference button is depressed	Third pushbutton from right in upper row
EXT DC	PUSH FOR EXTERNAL DC REFERENCE	Instrument uses the DC voltage applied to the REF HI and LO inputs for a reference voltage. Button is interlocked and will release when another reference button is depressed	Second pushbutton from right in upper row
EXT AC	PUSH FOR EXTERNAL AC REFERENCE	Instrument uses the AC voltage applied to the REF HI input as a reference voltage if the AC REF converter is installed. Button is interlocked and will release when another reference button is depressed	Righthand pushbutton in upper row (NOTE: See Para 3-22)

3-5 INITIAL ADJUSTMENTS AND CONTROL SETTINGS

3-6 The CIMRON® Model DSM 44 Digital Systems Multimeter has been adjusted at the factory and should not require special adjustments prior to operation except to set the OFFSET potentiometer for a 00.00 reading with the input terminals shorted, the unit in the DC mode of operation and on the 200 mv range.

3-7 START UP PORCEDURE

3-8 Connect the instrument to a source of 115 VAC power (230 VAC if switch A7S1 is set at 230V). Press the POWER switch, note that the display lights and wait 30 minutes for the instrument to stabilize.

3-9 AUTO/MANUAL RANGE SELECTION

3-10 In any of the modes of operation, autoranging or manual ranging may be selected. To select autorange, depress the AUTO switch button. To select a range manually depress the proper pushbutton. If an improper range/function combination is selected the units digit will blink the letter "F". When in autorange and the input voltage or resistance is greater than that for which the instrument is deisgned (over range), the ranging system will step up to the highest range for the function and the display will then begin to blink at a 4 times per second rate. In the manual range selection mode, the display will blink whenever the input voltage or resistance being measured is greater than the selected range.

CAUTION

Immediately disconnect the input if the display continues to blink. Overvoltage can result in permanent damage to the instrument.

3-11 DC VOLTAGE MEASUREMENTS

3-12 Select automatic or manual range control as desired. Depress the DC switch button. Connect two leads from the INPUT HI and INPUT LO terminals to the circuit to be measured. Allow the instrument to settle, if in autorange, and read the measured voltage and its polarity directly from the display. If in the manual range control mode, it may be necessary to uprange or downrange the instrument to bring the selected range in concert with the measured voltage.

NOTE: For all measurement functions the guard is normally connected to INPUT LO.

3-13 AC VOLTAGE MEASUREMENTS

3-14 Select automatic or manual range control as desired. Depress the AC switch button. Connect two leads from the INPUT HI and INPUT LO terminals to the circuit to be measured (see Fig. 3-1). Allow the instrument to settle, if in autorange, and read the measured voltage directly from the display. If in the manual range control mode, it may be necessary to uprange or downrange the instrument to being the selected range in concert with the measured voltage.

3-15 AC/DC (RMS) MEASUREMENTS

3-16 This operating procedure is contained in the special instruction furnished with the RMS converter.

3-17 FOUR WIRE RESISTANCE MEASUREMENTS

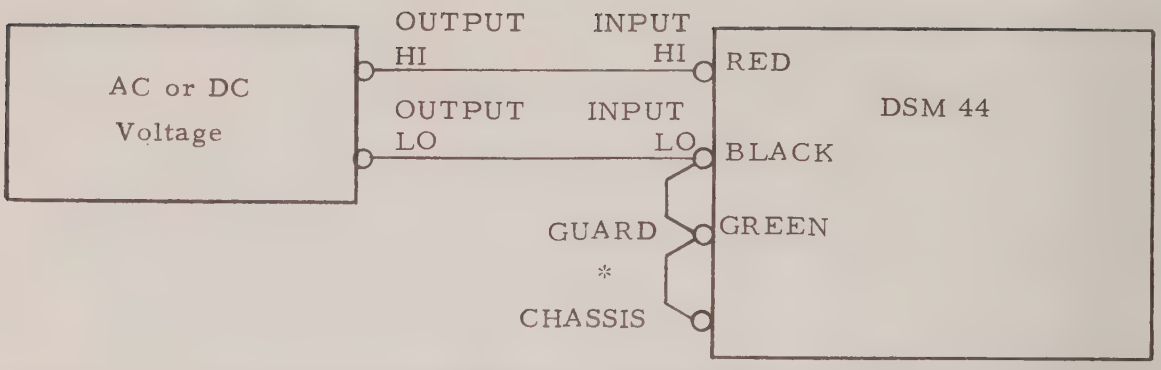
3-18 An optional set of leads are available for the four wire resistance measuring system, (see Section 1). In the four wire system, the constant current from the OHMS Converter is applied to the resistance to be measured through two independent leads. The input of the instrument is then connected across the resistor. Thus, only the voltage drop across the resistor is measured rather than that of the resistor and the leads connecting it to the instrument. This is of particular importance where the resistance under measurement is in the order of a few ohms or less. Figure 3-3 shows the connections between the instrument and the measured resistance.

3-19 EXTERNAL DC REFERENCE MEASUREMENTS

3-20 External DC reference, three wire measurements are accomplished by selecting EXT DC reference and applying a positive voltage between one and eleven volts to the yellow binding post. The common for the positive voltage should be attached to signal LO.

3-21 External DC reference, four wire bipolar measurements are accomplished by selecting EXT DC reference and applying a 1 to 12 volt DC voltage of either polarity from the yellow binding post to the blue binding post, refer to Figure 3-4. (See specifications for allowable voltage difference between REF LO and SIG LO). The display polarity will be the algebraic sum of the signal input polarity and the reference input polarity.

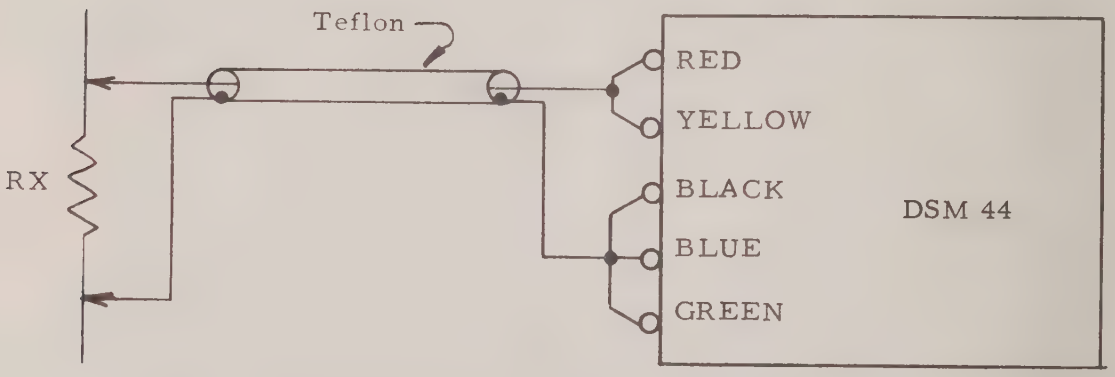
3-22 External AC reference measurements are accomplished by selecting EXT AC reference and applying an AC signal to the yellow input binding post with the low side to signal common, refer to Figure 3-5. In the PROGRAM position of the EXT AC reference range switch (Rear Panel), the DSM 44 is set so that whatever range is selected on the singal converter is also selected for the reference converter. The reference voltage input must be from .1V RMS to 1.2V RMS on the 1 volt reference range, from 1V RMS to 12V RMS on the 10 volts reference range, etc. Autorange should not be selected when operating in the PROGRAM position of the AC Reference Range Switch. The range displayed is the range of the signal converter.



*NOTE: Connection is necessary on .2 VDC range to minimize the effect of the common mode voltage from the DC standard.

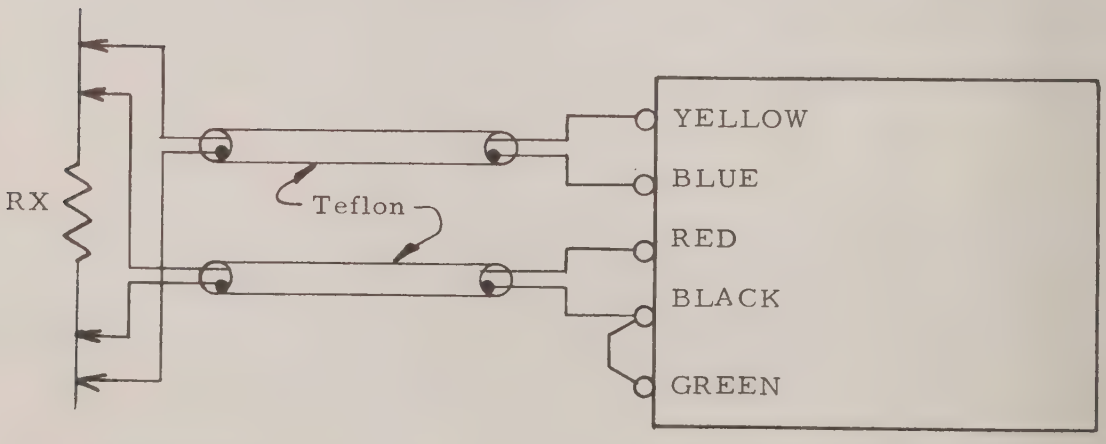
DC VOLTAGE MEASUREMENT CIRCUIT

FIGURE 3-1



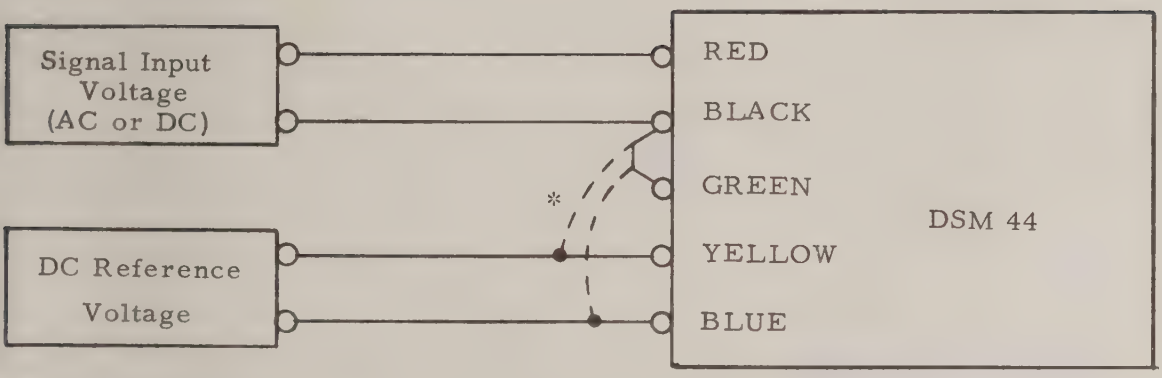
RESISTANCE CIRCUIT FOR HIGH KΩ MEASUREMENTS

FIGURE 3-2



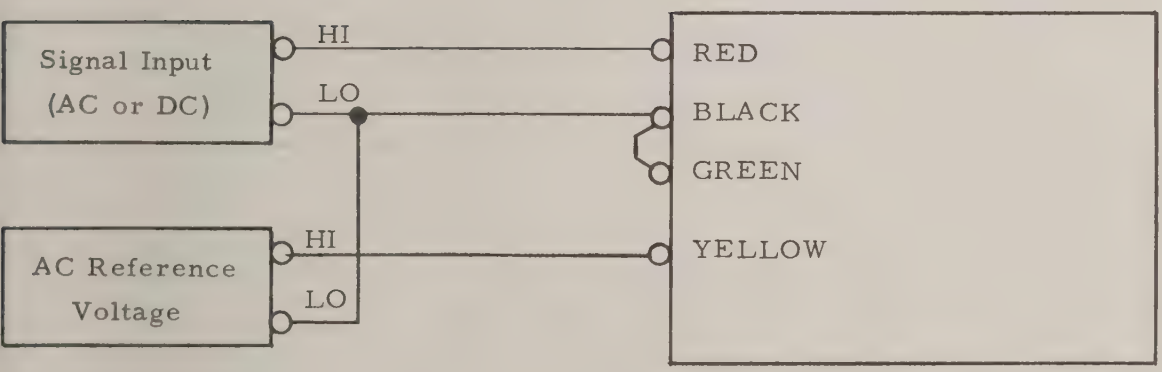
RESISTANCE CIRCUIT FOR ALL KΩ MEASUREMENTS

FIGURE 3-3



* Connection shown for reference only. Refer to specifications for allowable voltage separation.

CIRCUIT FOR EXTERNAL DC REFERENCE MEASUREMENTS
FIGURE 3-4



CIRCUIT FOR EXTERNAL AC REFERENCE MEASUREMENTS
FIGURE 3-5

SECTION IV
PRINCIPALS OF OPERATION

4-1 GENERAL

4-2 The CIMRON® DSM 44 Digital Systems Multimeter is a precision device that measures DC voltage and DC to DC ratios. An optional unit (AC converter) converts the input AC voltage to a DC voltage which is then measured by the mainframe circuitry. The optional OHMS converter pumps a precise current through the unknown resistance. The resultant voltage drop is then measured by the mainframe circuitry.

4-3 The instrument operates in 6 serial states of 8.88 milliseconds each (Reference timing diagram Figure 4-2). In states 0 and 1, the instrument is settling to the input voltage and is simultaneously being autozeroed to correct for initial offsets and drift in the analog circuits. In states 2 and 3, the unknown voltage is integrated. During states 4 and 5, a precise reference voltage is integrated to drive the integrator back to zero. The time for the reference integration is measured by the total number of 80ns clock periods it takes to integrate back to zero, thus accomplishing the analog to digital conversion.

4-4 The clock count is displayed on a 4 and one-half digit, gas discharge display. An automatic ranging system selects the proper range and the position of the decimal in the display. Manual ranging is also provided and is interlocked logically with the function to cause the units digit to blink a letter "F" if an improper range is selected for a given function. This false program indication will also occur if a "non-installed" function is selected.

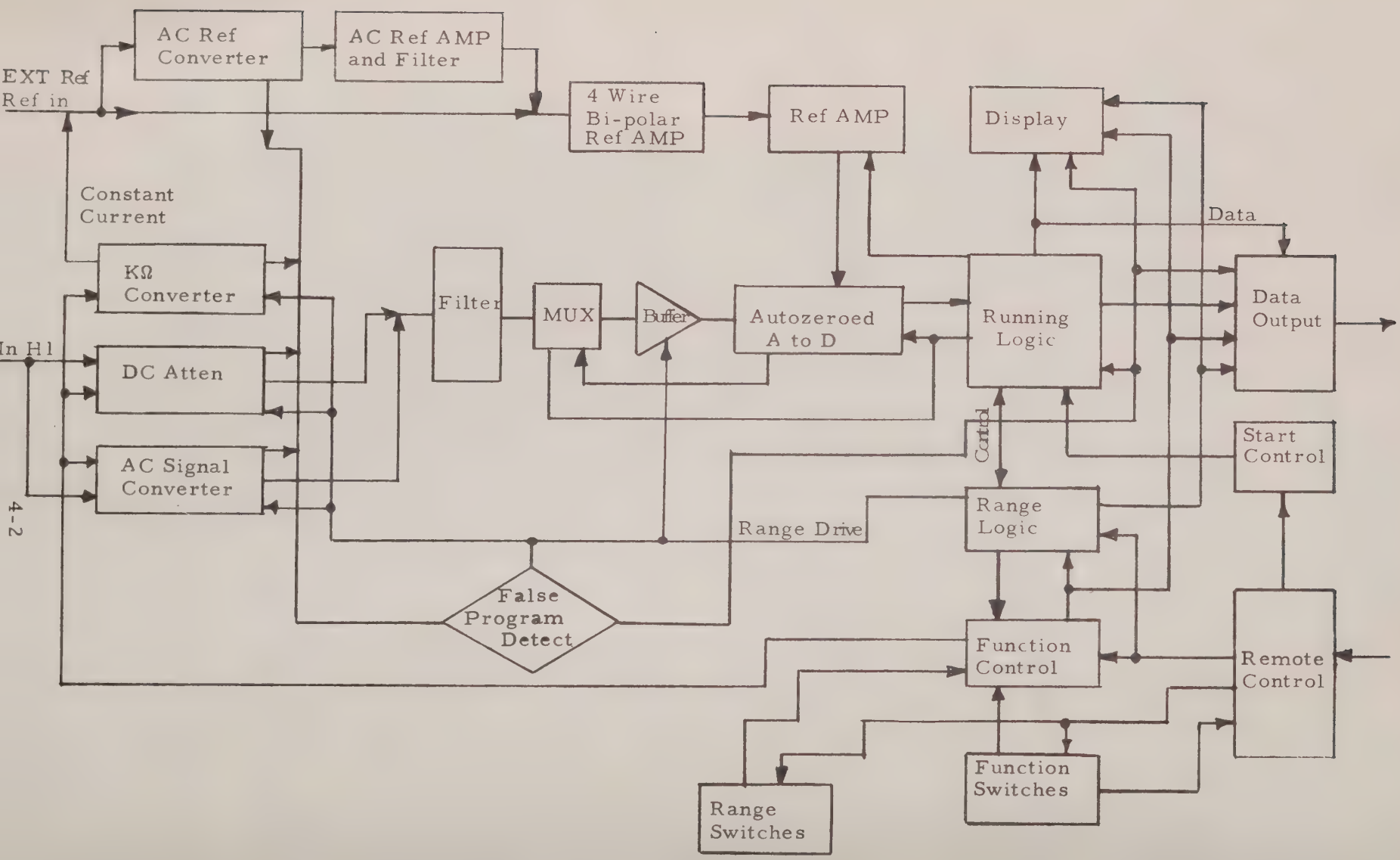
4-5 DETAILED DESCRIPTION - MAINFRAME CIRCUITS

4-6 "A block diagram of the DSM-44 is shown in Figure 4-1. Reference thereto, during the reading of the following paragraphs that describe the DSM-44 circuits, will assist in gaining an understanding of the operation of the unit.

4-7 During the E_O period, the autozero function compensates for the initial offsets and drift in the buffer, integrator and comparator. During E_S the integrator is disconnected while the buffer is slewing to the unknown input voltage. During E_X, the integrator is re-connected to the buffer and will integrate the unknown voltage. During E_T, the proper reference is integrated but the counter does not accept the first 100 counts thus "throwing" them away. (This is compensated for in the analog circuitry resulting in improved linearity). During the E_R period, the reference is integrated to zero while the counter is running and the resultant count is precisely proportional to the unknown voltage applied to the buffer. The E_{HOLD} state holds the instrument until it is re-started.

4-8 If the instrument is in autorange and the count exceeds 19,999 or is less than 1800, the ranging system will correct the range by one step. The instrument will repeat the conversion sequence and range step until the proper range is reached. If the instrument reaches the maximum range for the function programmed and the count still exceeds 19,999, the display will blink at a 4Hz rate.

4-9 When zero detect occurs, the clock is stopped and the count in the registers is strobed into the display/print latches. The outputs of the latches are applied to the decoder/drivers which, in turn, drive the display.



BLOCK DIAGRAM DSM 44

10 By controlling the input attenuation and buffer gain, the output of the ffer will be within a 0 to 2V range during measurements. This insures that e reference voltage is properly scaled to the input voltage.

11 The analog and digital circuits are independently powered and isolated om each other so that the input terminals may be connected to potentials as gh as 500V above or below the case potential. Signal paths between analog d digital circuits are through photocouplers. The OHMS converter uses a ird independent power supply enabling the OHMS converter to be floated from e mainframe analog power supplies for true four-wire ohms measurement.

16 DETAILED CIRCUIT DESCRIPTION

17 GENERAL

18 The schematic diagram for the main circuit board and display board are own in Drawing 8544-070, Sheets 1, 2 and 3. The schematic for the power pply is shown in Drawing 8544-078.

19 POWER SUPPLIES

20 Primary power is applied to the transformer from P7 through F1 to the ont panel switch. When A1S1 is closed in 115 volt operation, the two primaries e connected in parallel across the input line voltage. In 230 volt operation e primaries are connected in series across the 230 volt line.

21 The +190 volts required by the display is rectified from the 9-10 secondary A7CR5 and filtered by A7C6.

22 The +5V logic power is rectified by A7CR1 and A7CR2 and filtered by C4. Regulation is performed by A7IC1.

23 The -10 volt power is rectified by A7CR3 and A7CR4 and is filtered by C5.

24 A7CR7 rectifies the voltage required by the OHMS converter. This is tered by A7C9 and A7C10. The regulation of these voltages is performed on e OHMS converter board.

25 The ±18 volts required for the analog section is rectified by A7CR6. These e regulated by A7IC4 and A7IC5.

26 The +5 volts to power the few logic chips inside the guard is provided by IC3 and since this is a low power requirement, it is regulated down from the 3 raw voltage.

27 PRECISION REFERENCE SOURCES

28 The two 10V reference sources, used as inputs to the integrator during E_R, e obtained from the circuits associated with A1IC72 and A1IC73, which are own in schematic diagram 8544-070. When operating with internal reference, K7 is de-energized which enables A1Q12 and A1Q14. (A1Q13 and A1Q15 are iched off.) A1CR33 is a temperature compensated reference diode with a tage of approximately 6.2V. This positive 6.2 volts is coupled through A1Q12 noninverting input, pin 3, of A1IC72. This amplifier has a gain of 1.6 as set A1R98 through A1R101, so the output at the cathode end of A1CR37 is plus 10V. CR37 prevents the output of A1IC72 from starting in a negative direction at n-on. A1R90 sets the proper operating current for A1CR33. A1R91 is the o offset adjustment of A1IC72.

4-29 A1IC73 is an inverting operational amplifier. Its output may be adjusted to minus 10 volts by A1R104. The zero offset adjustment for A1IC73 is A1R108.

4-30 When operating with an external reference, A1K7 is energized which pinches off A1Q12 and A1Q14. The same voltage enables P-channel FETS A1Q13 and A1Q15. This connects the external reference to pin 3 of A1IC72 and changes the gain of A1IC72 to unity. Thus, the output of A1IC72 will track the input in external reference.

4-31 DC INPUT SIGNAL ROUTING

4-32 In low DC (.2V and 2V ranges), the input HI from the red input terminal is routed through pins 10 to 9 of A1K4, through A1R67 and through contacts 6 and 7 of A1K4 and A1R148 to point E1. Point E1 is the input to the buffer.

4-33 In high DC ranges (20V, 200V and 500V ranges) the input is routed through A1K5 to E6 which is the input to the attenuator composed of A1R70 through A1R76. In the 20V and 200V ranges, the attenuator output is taken from the wiper arm of A1R75, through the actuated contacts of A1K3 to point E1. In the 500V range, the attenuator output is taken from the wiper of A1R74 through the actuated contacts of A1K2 to point E1. Thus, in all ranges of DC, the voltage of E1 is zero to 2 volts when not in an overload condition.

4-34 The input low is routed through A1R61 to common. A1R63 is adjusted to compensate for thermal effects in the input circuitry.

4-35 INPUT PROTECTION

4-36 FETS A1Q8 and A1Q9 are connected as low leakage diodes to protect the circuits from excessive input voltages. If the voltage at E1 reaches minus 2.3 volts (approximately), A1Q8 will start to conduct as its gate is biased at minus 2 volts. As the input increases in a negative direction, the current through the series connection of A1Q8 and A1R67 will cause a voltage drop between the input terminal and E1 that will limit the voltage at E1 to approximately minus 5 volts. In the most sensitive range (.2V), with 500 volts applied to the input, the current through A1R67 will approach 10 ma and the voltage at E1 will remain at a safe level. A1Q9 protects the instrument in a similar manner when the input voltage is positive.

4-37 FILTER

4-38 When the filter is actuated, A1K1 energizes connecting the filter to point E1. If noise causes the potential at E1 to move in a positive direction, this change will be coupled into filter amplifier A1IC62 through A1C24. The error voltage is applied to the inverting input. The error is amplified and inverted by A1IC62 and coupled back to point E1, through A1C26, thus cancelling the original error signal.

4-39 BUFFER AMPLIFIER SWITCHING

4-40 Referring to the timing diagram of Figure 4-2, it will be seen that A1IC59 pin 11 output is low during E_X time. A1IC63 and A1CI64 are operating as open loop amplifiers. Pin 3 of A1IC63 is referenced to plus 1.5V and pin 2 (inverting input) is connected to A1IC59 pin 11. If A1IC59 pin 11 is low, then A1CI63 output will be approximately +15V. This will turn on A1Q10. A1Q11 will be turned off by A1IC64 which is complementary to A1IC63. When this occurs, the output of the buffer amplifier, A1IC65, will swing to the input voltage. This output is bootstrapped through A1R112, A1R84 and A1R85 to the gates of A1Q10 and A1Q11 to set the bias such that the gates will not conduct.

-41 When operating in the X10 gain mode, A1K8 will be energized changing
ıe gain of A1IC65 from 1 to 10. A1K8 will also ground the bottom of A1R113
ttenuating the bootstrap feedback by 10 to maintain the proper biasing of
1Q10 and A1Q11.

-42 INTEGRATOR

-43 The output of the buffer is fed through A1R114 and A1Q16 to the summing
nction (pin 2) of integrating amplifier A1IC70. Referring to timing diagram
igure 4-2, it may be seen that A1IC66 will turn on A1Q16 during E_X time.
his will cause the output of A1IC70 to ramp in a direction opposite to the
oltage at the output of the buffer. At the end of the E_X period, A1Q16 will
nch off and, if the buffer input were positive, A1IC67 will turn on A1Q17.
1Q17 will apply the negative 10 volt reference through A1R20 to the integrator
mming junction. This will cause the integrator to ramp back towards zero.

-44 COMPARATOR

45 A1IC71 is an operational amplifier operating open loop. Its principle
e is to provide a steep transition at its output when the ramp of the integrator
sses through zero. When A1Q17 was turned on by A1IC67, A1Q20 was also
rned on. This displaced pin 2 of A1IC71 in a positive direction by the analog
uivalent of 100 counts. This compensates for the 80μs (100 digits) that is
rown away by the logic circuits during E_T time. When the integrator ramp
tput equals the throw away offset, the comparator will change states causing
1Q26 collector to change states. This is 0 Det and is coupled through A1IC61C,
rough photocoupler A1IC58, to the logic circuits causing them to shut down.

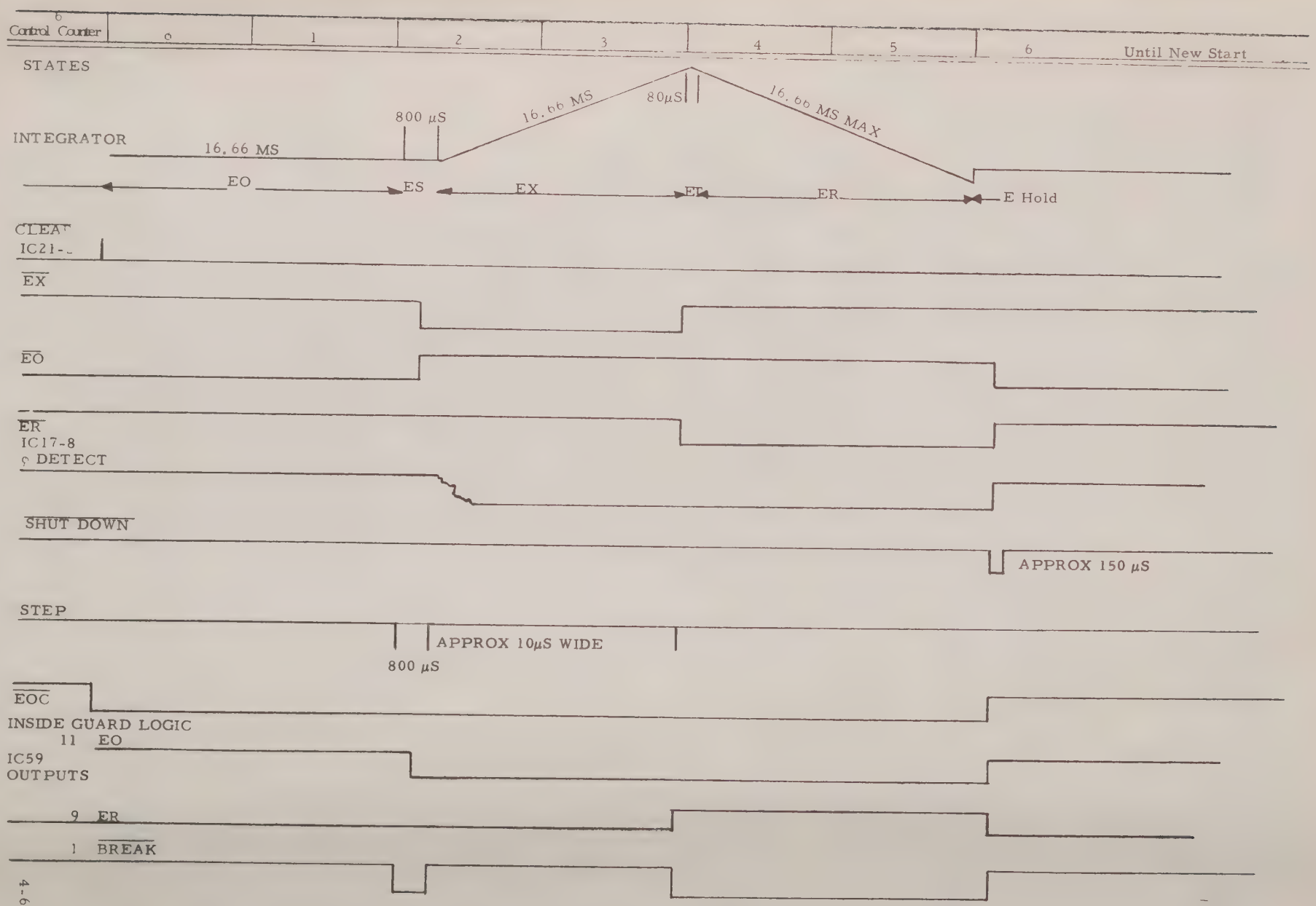
46 AUTOZERO

47 At 0 Det, the shutdown pulse from the logic sets counter A1IC59 to the
tozero phase. The shutdown also turns on FETS A1Q21 and A1Q22 for
proximately 150μs. This removes any residual charge on integrating
pacitor A1C37.

48 By reference to the timing diagram, Figure 4-2, and examination of the
ths of the output signals from A1IC59, it will be determined that FET's A1Q10,
Q17, A1Q19, A1Q20 and A1Q23 are now pinched off. At the same time, FET
Q11 is on, applying a common to the buffer input and A1Q16 is also on, connecting
buffer output to the integrator summing junction. When A1Q11 is turned on,
IC64 will turn on A1Q25.

49 The instrument is now in autozero and any errors caused by initial offsets
drift in A1IC65, A1IC70 and A1IC71 will by nulled out by a compensating
rrent which is fed to the integrator summing junction through A1R116. If the
tput of the buffer were offset in a positive direction, then the output of the
egrator would be negative as would the output of the comparator. This would
coupled through A1Q25 to the gate of follower A1Q24 and its output would
ply a negative current through A1R116 to the integrator summing junction, thus
ncelling the offset.

50 At end of the E_O phase, A1Q25 will pinch off and the voltage stored on
C44 will hold the gate of A1Q24 at the proper potential until another autozero
ıse is initiated.


6
Control Counter
0
1
2
3
4
5
6
Until New Start
STATES
INTEGRATOR
800 µS
16.66 MS
80µS
16.66 MS MAX
16.66 MS
EO
ES
EX
ET
ER
E Hold
CLEAR
IC21-
EX
EO
ER
IC17-8
DETECT
SHUT DOWN
APPROX 150 µS
STEP
APPROX 10µS WIDE
800 µS
EOC
INSIDE GUARD LOGIC
11 EO
IC59
OUTPUTS
9 ER
1 BREAK

4-51 GUARDED LOGIC

4-52 The guarded logic is that portion that operates with reference to the analog common potential. This includes A1IC56 through A1IC61. These are shown on the upper left portion of the analog schematic Drawing 8544-070.

4-53 The sequence starts with the shutdown being coupled across photocoupler A1IC57. The shutdown pulse is approximately 150μs wide and it is inverted by A1IC61D and presets the 7490 counter A1IC59 to a nine state. The nine state is autozero with the eight output (pin 11) and the one output (pin 1) high.

4-54 When the first $\overline{\text{step}}$ pulse arrives at the start of E_S time, the counter steps to a zero (all outputs low). This generates the $\overline{E_X}$ at pin 11 and the break at pin 1. At the end of E_S, the step pulse will advance the counter to a one closing the break, but leaving the $\overline{E_X}$ condition set. At the end of the E_X period, the final step pulse will advance the counter to a two. Thus, the $\overline{\text{break}}$ is re-established and A1IC59 pin 9 (the two output) will go to a high clocking the polarity of the zero det. into A1IC60. The same high is applied to A1IC61 A and B. Depending upon polarity, either pin 5 or pin 6 of A1IC60 will be high creating the NAND condition at one output of A1IC61. This will turn on the proper reference to drive the integrator back to zero.

4-55 COUNTING LOGIC

4-56 The counting logic starts with the crystal-controlled, 1.2MHz, free running oscillator. Between readings, the clock is blocked from the counter string by A1IC8, pin 5, being low. A reading is initiated by A1IC30, pin 8 going high. This clears all the counters to zero and sets detect latch A1IC27A. A1IC8, pin 5 is connected to A1IC27, pin 5 so the clock is now enabled and the counters are counting the 0 and 1 states as shown in the timing diagram, Figure 4-2. A1IC10 is the state counter and its outputs control the phases of the instrument.

4-57 When A1IC10 has counted to a 2 (20,000 counts), A1IC8 will go low starting the E_X phase. Due to the logic of A1IC17C and A1IC19D, each time A1IC18D changes states a narrow, low going pulse will be generated at A1IC19, pin 11 which sets the throwaway latch, A1IC20A. By following the logic of the throwaway latch, it will be seen that A1IC11 is now held in a cleared state. 1000 counts after A1IC20A was set, A1IC21F will clock A1IC20A back to a cleared state. The counter will now restart counting the E_X phase. This 1000 counts is the break period, E_S, before the start of E_X which is used to slew the buffer amplifier to the input voltage.

4-58 When A1IC10 has counted through states 2 and 3 and sets a 4, A1IC18 pin 11 will go high setting the throwaway latch again. By following the logic of A1IC20A it will be seen that 100 counts will be thrown away this time. After the throwaway, the counter will count the E_R period.

4-59 The count will be stopped when 20,000 is reached if 0 Det has not occured. At 20,000 counts, state counter A1IC10 has a 6 output. The decoded 6 through A1IC18C and B will clock A1IC27A back to a reset condition.

4-60 At the end of the E_X phase, A1IC18 goes high and this level transition clocks A1IC27B storing the state of the 0 Det input from the analog section. At this time, A1IC19C has like inputs so its output will be low. When the analog ramp is driven through zero, the 0 Det line will change states making the inputs of A1IC19C unlike. This will make its output high and make A1IC25, pin 10 high. The 4 out of the state counter will make A1IC25, pin 11 high so when A1IC25 pin 9 goes high, pin 8 will go low resetting A1IC27A and ending the reading. A1IC25 pin 9 is controlled by A1IC22C.

For A1IC22, pin 10 to go high, the throwaway latch must be reset and the clock in a low state.

4-61 When A1IC27A is reset, A1IC30C will generate a very narrow low at pin 12 which is inverted by A1IC18A. This strobes the readout storage latches A1IC7 and A1IC10 through A1IC13. Starting at the same time as the strobe, A1IC29C will generate the $\overline{\text{shutdown}}$ pulse which is coupled to the analog section.

4-62 Each time the throwaway latch A1IC20A is set or reset, A1IC19B will generate a narrow high which is inverted by A1IC29D and becomes the $\overline{\text{step}}$ drive to the analog section. The step that is generated at the end of E_T time is suppressed by A1IC29D, pin 12 going low approximately 20μs after E_R has started.

4-63 START LOGIC

4-64 The DSM 44, operating in internal start mode, is started by the Oscillator A1IC15. A1IC15 is a 4Hz free running multivibrator. The output at pin 3 is fed to the clock input of A1IC20B. With the D input grounded, $\overline{Q}$ (pin 8) will go high when the clock goes high. As A1IC31,Pins 9 and 10 are normally high, this makes pin 8 low. A1IC22, pin 12 will be low between conversions so pin 13 will be high making A1IC24, pin 4 high. On the next clock pulse from the clock oscillator, A1IC30, pin 9 will go low and pin 8 will go high clearing the counter. This starts the instrument. The $\overline{\text{clear}}$ will set A1IC20B ready for the next start.

4-65 When operating in TRACK mode, the internal start is inhibited by $\overline{\text{TRACK}}$ causing A1IC31, pin 9 to go low. The same low is applied to A1IC22, pin 2. Thus when a conversion is completed and A1IC27A resets, A1IC22, pin 3 will go low and 10μs later A1IC30, pin 10 will go low re-starting the instrument.

4-66 The third method of starting is external start/autorange re-start. In this mode the instrument will take one reading and stop unless an autorange change occured. If an autorange change occured, it will re-start without a new external start command. This feature also re-starts the instrument when in internal start mode and an autorange change occurs.

4-67 R-S flip-flop A1IC28A/A1IC23C is reset by $\overline{\text{clear}}$ applied to A1IC23, pin 9. It will be set by $\overline{\text{EXT START}}$, $\overline{\text{UP}}$ or $\overline{\text{DN}}$ applied to A1IC28A. When the flip-flop is set,a narrow low at A1IC16, pin 11 will start the delay mono, A1IC16. When the mono has timed out, a narrow low at A1IC23, pin 3 will start the instrument.

4-68 The delay timing is varied by pinching off A1Q4 to increase delay from the 100μs minimum to 90 ms. Pinching off both A1Q2 and A1Q4 will increase the delay to 250 ms. If A1R20 is removed (True RMS Converter), the maximum delay increases to approximately 325 ms. Level shifting to control A1Q2 or A1Q4 is accomplished by the emitter of A1Q1 or A1Q3 going low turning off the emitter-base junction which allows the collector to go to the -10 volt levels.

4-69 The $\overline{\text{EOC}}$ signal, which in turn, sets the Date Gate, is generated by R-S flip-flop A1IC30A and A1IC23D. The $\overline{\text{clear}}$ pulse at A1IC30, pin 3 clears the flip-flop and the $\overline{\text{shutdown}}$ pulse sets the flip-flop. When the flip-flop is set, A1IC26, pin 2 will rise to a high after the delay set by A1R29 and A1C10. If an autorange change set R-S flip-flop, A1IC28A/A1IC23C, pin 1 of A1IC26A will go low before pin 2 goes high thus blocking the date gate until the instrument is in the proper range.

4-70 FALSE PROGRAM LOGIC

4-71 All false program decodes are brought together at A1IC50A. If any input to A1IC50A goes low, the output will go high. This will turn off A1Q6 removing the function relay drive voltage. The same high will inhibit A1IC14 from counting thus locking up the instrument. This same high is also applied to A1IC21, pin 3 and A1IC8, pin 1. A1IC21, pin 4 will go low forcing all BCD lines to the units decoder on the display to a high thus setting a hexadecimal "F". The high on A1IC8 is ANDED with the 4Hz start oscillator and is fed to the blank input of the units decoder causing the "F" to blink on and off.

4-72 The false program logic for a function not installed is quite simple. Take A1IC33B as an example. When $\overline{K\Omega}$ is programmed, A1IC33, pin 5, will go low and if the KΩ converter is installed, A1IC33, pin 4 will also go low. A1IC33B is an exclusive OR gate, and if the inputs are the same the output will be low. If the KΩ converter were not installed and KΩ were programmed, A1IC33, pin 5 would go low and pin 4 would remain high thus making the output high. Any high into A1IC32B will make its output low and in turn the output of A1IC50 a high.

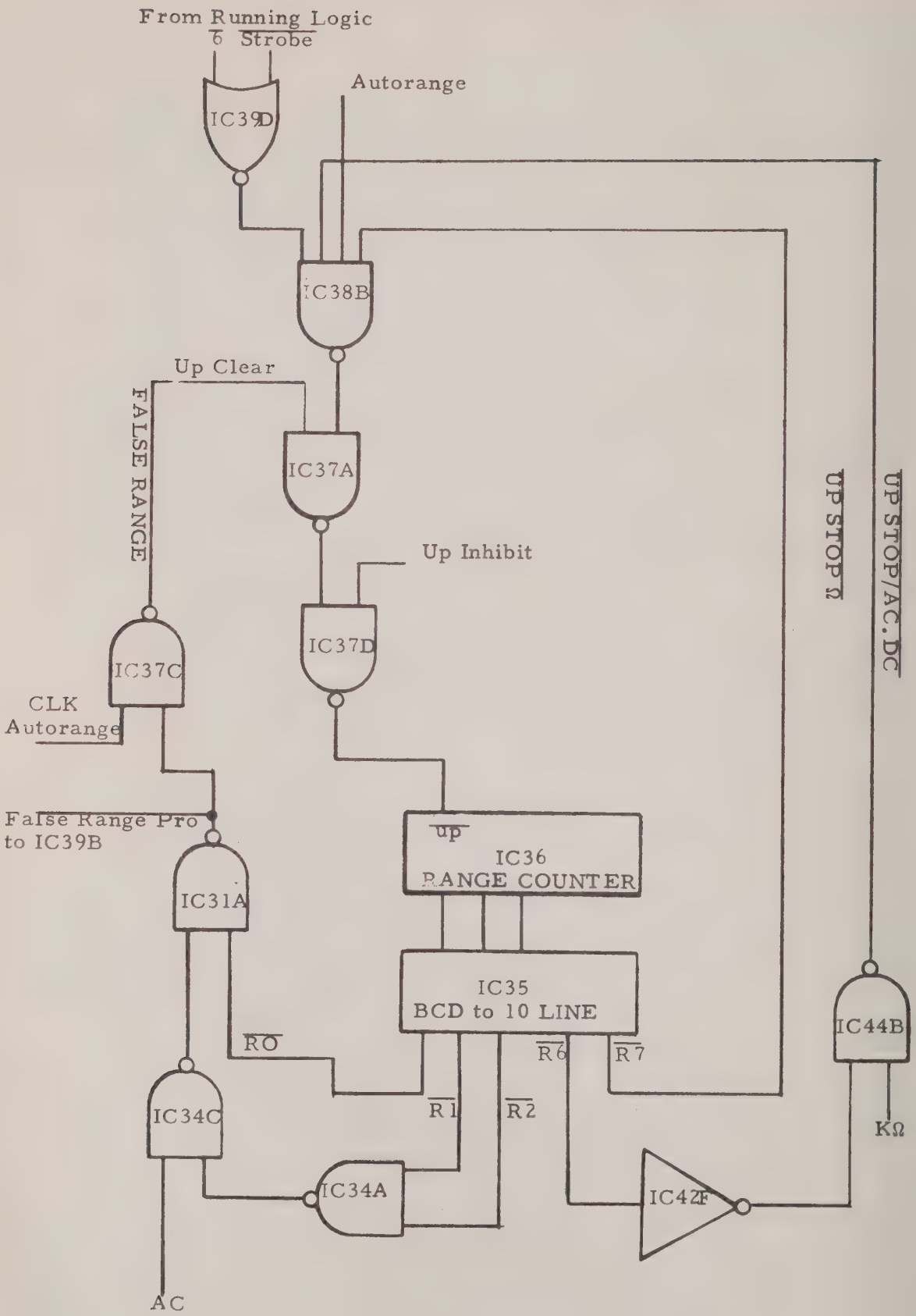
4-73 An example of incompatible function false program decoding follows. If autorange is selected, A1IC22, pin 6 will be low. At this time, if delay inhibit or $\overline{TRACK}$ is programmed, then A1IC22, pin 5 will be low and pin 4 will be high. Any high into A1IC32C will produce a low output to A1IC50A thus setting the false program indication.

4-74 The third way a false program may be set is to select a range that is not compatible with the function selected. Example: 20,000 range in AC or DC. When this incompatibility occurs, the false $\overline{RNG\ PRO}$ line to A1IC50, pin 1 will go low setting the false program indication. The method of setting the false $\overline{RNG\ PRO}$ line will be covered in the range control description.

4-75 RANGE CONTROL AUTORANGE

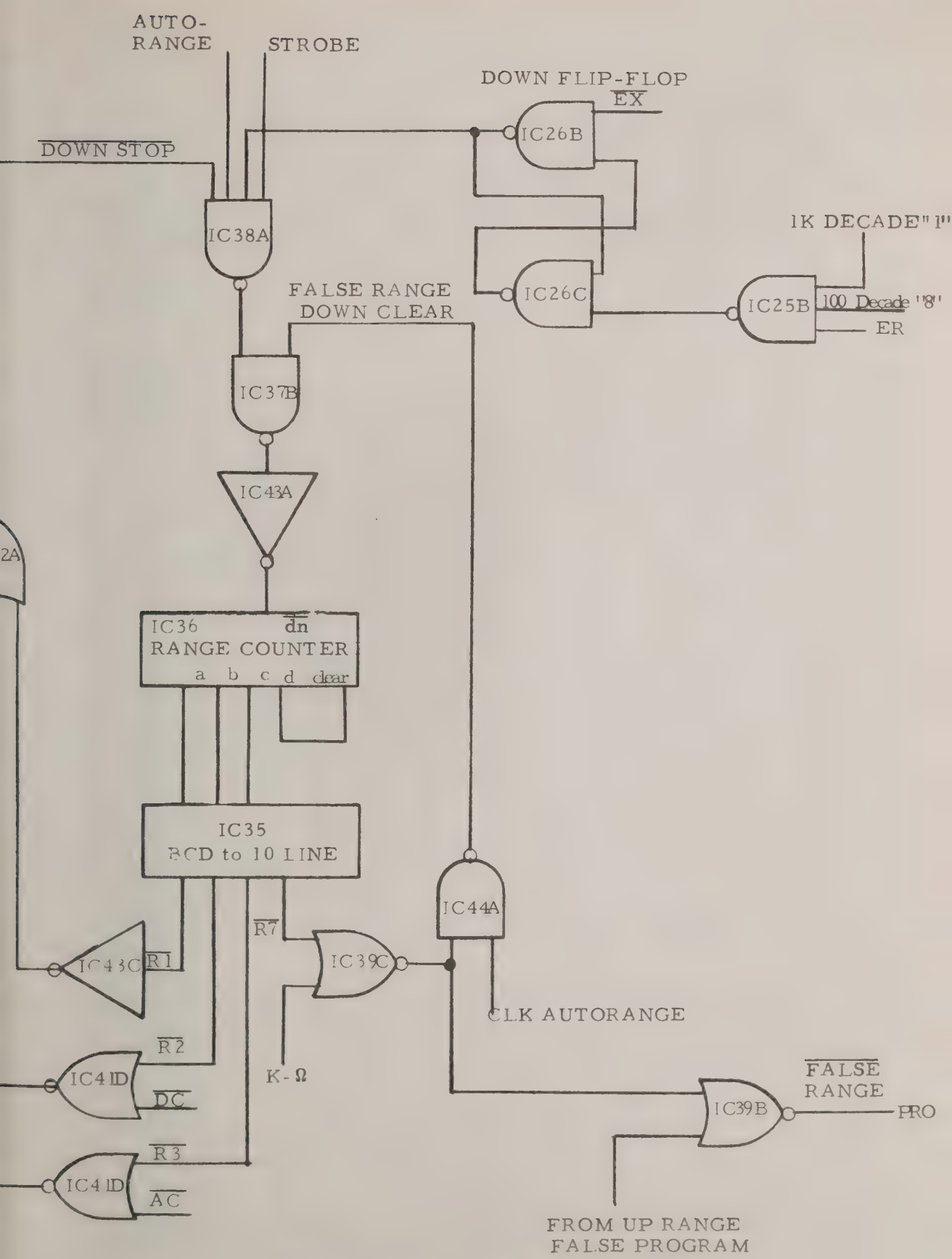
4-76 To better understand the automatic uprange, refer to Figure 4-3 which is a simplified schematic of the gates used for uprange control. If the strobe occurs with a 6 set in the state counter, the instrument is overloaded in the present range and an uprange is required. A1IC39D output will go high at this time and A1IC38B output will go low. This is twice more inverted and the $\overline{up}$ input to the range counter will go low stepping the range counter up one range. This action will continue until the proper range is acquired or an $\overline{up\ stop}$ causes an input to A1IC38B to go low blocking further upranging. By following the logic of IC34A, IC34C, IC31A and IC37C it will be seen that if a range that is not compatible with a given function where somehow set, it would be counted into a proper range at a 1.2MHz rate.

4-77 Figure 4-4, which is the simplified schematic of the automatic down-range logic at each conversion, the down flip-flop is set by $\overline{E_X}$. It will be reset each conversion when, during E_R time, the count exceeds 1800. If the count does not exceed 1800, the flip-flop will remain set and IC38A will be enabled by the strobe, generating a low at the output of IC38A. This is twice inverted and applied to the $\overline{DN}$ input to the range counter, stepping it down one range. This will occur each conversion that the underrange is present until the $\overline{down\ stop}$ line inhibits further down ranging. If the logic inputs to IC32A are analyzed, it becomes clear when the down stop occurs. If the counter turns on with the "d" set, this is fed to the counter clear thus putting the counter into a useable range. If the range counter is in range 7 and not in KΩ, IC39C and IC44A will clock the counter down one step.



DSM 44 UPRANGE LOGIC

FIGURE 4-3



DSM 44 DOWN RANGE LOGIC
FIGURE 4-4

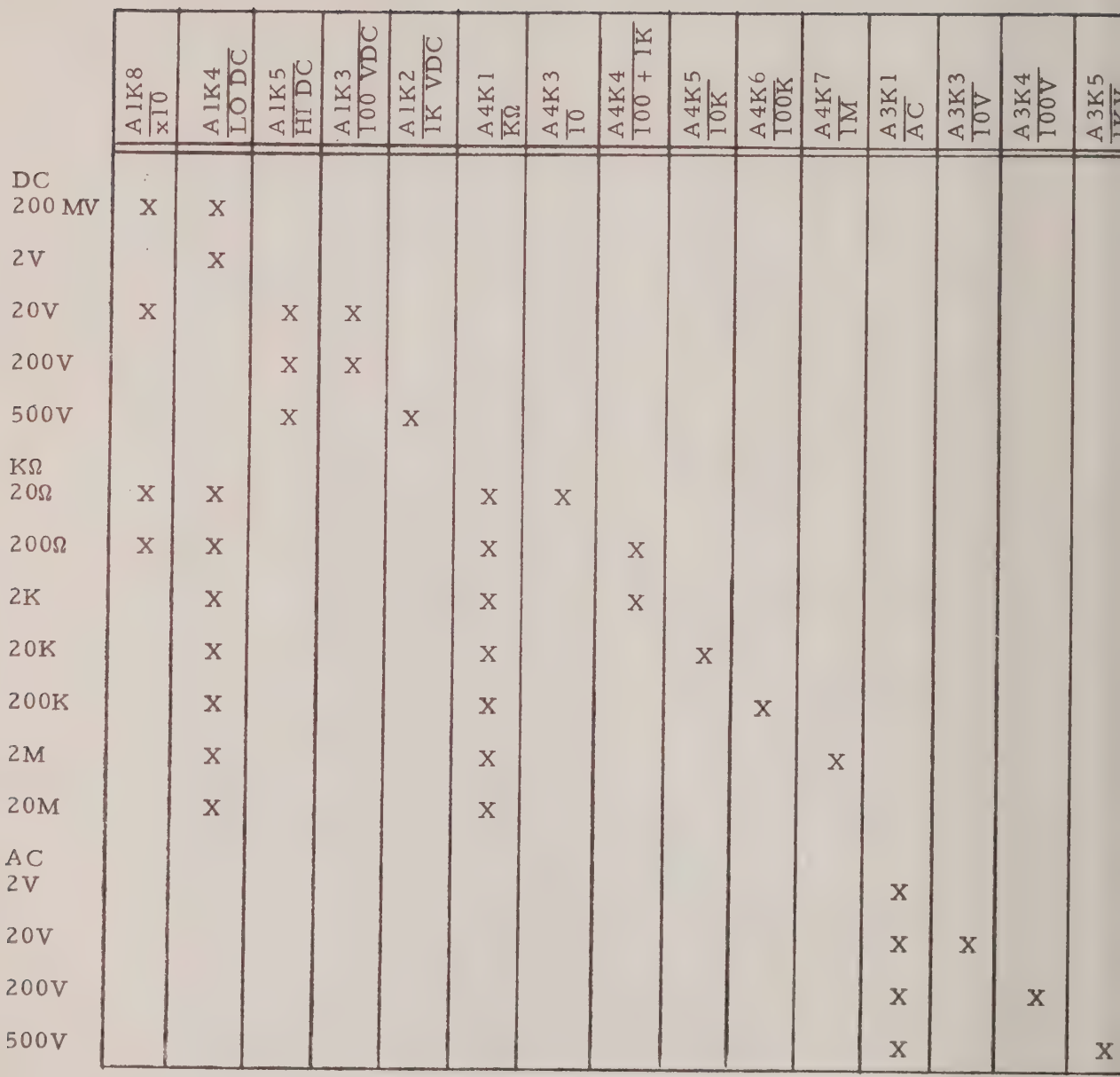


Figure 4-5. DSM 44 Relay Matrix

4-78 MANUAL RANGE CONTROL

4-79 In local control, when a range button is depressed, the auto-button (S1-B) is interlocked and pops out. This puts a low at A1IC47, pin 2 forcing the output high. This high is inverted by A1IC42A and puts a low at A1IC36, pin 11. The range counter, A1IC36, is now ready to accept a manual range program. A1IC49 and A1IC50B decode the pushbutton program to a BCD format which is applied to pins 1, 10 and 15 of the range counter.

4-80 RANGE DRIVE DECODING

4-81 The range drive decoding is clear-cut and easily understood if the relay matrix, Figure 4-5, us used while tracing the outputs of the range counter A1IC36.

4-82 READ OUT

4-83 The display decoders A2IC2 through A2IC5 are BCD to seven-segment decoder-drivers. The drive current per segment is set by a programming resistor between +5 and pin 3. Pin 4 of the DD700 is the $\overline{\text{BLANK}}$ input and is used to cause the display to blink in overload. A2IC1 is a BCD to 10 line decoder which is used to drive the decimals. A2DS2 through A2DS9 are light emitting diodes used as function annunciators.

4-84 AC CONVERTER (AVG CAL IN RMS) OPTION 01

4-85 The AC converter is a precision rectifier with an attenuator and buffer input stage.

4-86 The input signal arrives at A3J8, pin 1 and is applied through A3K1 to A3R1. A3C4 is the DC blocking capacitor which is monentarily shorted during up or down ranging to discharge it thus enabling a faster settling time. In the 1 volt range, the input signal is attenuated to half by the divider formed by A3R1 and A3R4. In the higher ranges, A3R4 is paralleled by A3R5, A3R8 and A3R11 which produce attenuations of 20, 200 and 2000, respectively.

4-87 The attenuated input is applied to buffer A3IC1 which is a non-inverting 1 to 1 amplifier. A3Q1 and A3Q2 are FETS connected as low leakage diodes to protect the input to A3IC1 from overvoltage. A3R3, A3R14, A3R16 and A3CR6 form a current compensation circuit to zero the current at A3IC1, pin 3.

4-88 A3IC2 is an inverting op-amp with a gain of 4.4. Its purpose is to properly scale and buffer the input to A3IC3.

4-89 A3IC3 is the precision rectifier which performs the AC to DC rectification. When the instantaneous voltage at A3IC2 is plus 1 volt, A3IC3 output is minus thus turning off A3CR8. This will cause the voltage at the cathode of A3CR8 to be +.5 volt as determined by the values of A3R26, A3R27 and A3R31. When the instantaneous input voltage to A3IC3 is minus 1 volt, the output of A3IC3 will swing plus and close the feedback loop at a gain of .5. Thus, the instantaneous output at the cathode of A3CR8 will always be half the input amplitude and always positive. A3CR7 and A3R30 limit the negative swing of A3IC3 so recovery time is minimized when the output of A1IC3 swings positive.

4-90 The rectifier output is filtered and applied to the output buffer A3IC4 which buffers the signal to a low impedance so that the input signal will not interact and cause errors.

4-91 OHMS CONVERTER

4-92 The OHMS converter is shown in Schematic 8544-072. It is essentially a constant current generator that applies a precise current through the unknown resistor. The resultant voltage drop across the resistor is measured by the DC voltmeter section of the main frame which displays the measured voltage in terms of resistance. To accomodate the wide range of measurements, not only must the current value be different for some ranges but the gain of the input buffer must be changed as well.

4-93 The OHMS converter has its own isolated power supply on the main frame power supply board. This power supply puts out filtered, but not regulated, inputs to the ohms converter of approximately +22 volts and -22 volts. This is regulated to ±15 volts by A4Q1 and A4Q2. This power supply is completely isolated from the digital and the analog supplies.

4-94 A4IC2 is the reference supply for the ohms converter. A4IC2 is adjusted by A4R31 for -10V referenced to TP2. This will provide the proper current through A4R28 for best temperature track of the reference diode A4CR11. A4CR11 is a 6.35 volt device so the voltage at the pot arm of A4R17 can be adjusted to -1 volt. If the pin 3 input of A4IC1 is -1 volt then the summing junction (pin 2) will be -1 volt referenced only to the ohms converter and not to the main frame. Thus, for example, if A4K5 were energized, it would connect A4R11 and A4R12 from the summing junction to common. The summing junction is at minus 1 volt so the current through A4R1 and A4R12 would be 100μa if A4R12 is adjusted properly. The feedback loop of A4IC1 is through the unknown resistor. To balance the summing junction, 100μa must flow through the unknown resistor. When this is measured on the 1 volt range of the main frame, the resultant is the 20K ohm range. The inputs to A4J13 indicate which resistors are used in which ranges. In the 20,000K ohm range, is all relays are de-energized leaving only A4R21 and A4R22 in the circuit.

4-95 A4Q5 serves to limit the output swing of the OHMS converter to 5 volts or less.

4-96 A4Q6, A4IC3 and associated circuits serve to protect the OHMS converter if an accidential voltage of up to 500 volts RMS is applied to the ohms reference leads. (Yellow and blue). If the fault voltage is negative or is the negative swing of an AC voltage, A4CR16 will block and protect the amplifier. A4Q3 will conduct and reference the other input lead to common. When the fault voltage is in a positive direction, A4Q6 will start to conduct but will be current limited to approximately 12 ma by A4R18, A4CR14 and A4CR15. If this were allowed to continue A4Q6 would enter secondary breakdown and would be destroyed. The same positive voltage is applied across A4R24 to pin 2 of A4IC3 causing its output to swing negative which in turn reverse biases A4Q6 cutting it off. This will occur at approximately +5V and it takes approximately 2μs to complete the turn off. A4CR17 protects the input of A4IC. A4CR18 and A4R25 set the reference point for A4IC3. A4CR12 and A4CR13 protect the emmiter-base junction of A4Q6 from excessive reverse bias.

4-97 4 WIRE AUTO BIPOLAR EXTERNAL REFERENCE

4-98 The 4 wire option allows ratios to be taken across a bridge or other such application where the reference input low is not at the same potential as the signal input low.

4-99 A10IC1 and A10IC2 buffer the inputs to instrumentation amplifier A10IC3. The output of A10IC3 is the difference between the inputs. If the difference between A4P10, pins 4 and 5 is 5 volts, then the output of A10IC3 is 5 volts. The configuration of A10IC3 is such that it is inverting. If a -10 volt ref is applied, the signal at its output is +10 volts. This +10 volts is fed to the reference output A10P10, pin 8 through A10Q2. If the reference input were +10V then the -10V at A10IC3 output would be inverted by A10IC4 and fed to the reference out through A10Q1. Control for A10Q1 and A10Q2 is from A10IC5. If the A10IC4 output is plus, then A10IC5 output is minus which pinches off N-channel FET A10Q2 and enables P-channel FET A10Q1.

4-100 When the input reference voltage is minus, A10IC5 will turn on A10Q3 actuating A10K1. A10K1 is used to send reference polarity information to the algebraic polarity circuits of the main frame.

4-101 AC REFERENCE CONVERTER

4-102 The AC reference converter is identical to the signal converter with a 2 volt full scale output.

4-103 The A9 board is a times 10 amplifier and filter. When external AC REF is programmed, the reference signal goes through the reference converter where it is rectified and sent to the A9 board. When in external AC reference, A9K1 is actuated, applying the reference voltage to the main frame reference input. The filter on the A9 board is identical to the main frame filter and is actuated by the same signal as the main frame filter.

4-104 REMOTE CONTROL

4-105 The Remote board will accept parallel or serial-by-character information and latch the information if desired. A12IC4, IC6, IC7 and IC8 are quad latches used to store the incoming program. Each latch has a NAND gate on its strobe input. One input of each NAND gate is connected to the master strobe, so that when the master strobe is activated, all data will be latched. The other input to each NAND gate goes to an individual strobe for use when entering data in serial-by-character format.

4-106 The remote board also decodes the BCD information to 10 line for use in the instrument. The DSM 44 will not go into remote mode without the remote board installed, due to the interlock formed by A12IC17D and A12IC12B. The $\overline{\text{Remote out}}$ line inhibits the internal control lines.

4-107 PRINT BOARD

4-108 The numerical data out is latched in the DSM 44 mainframe, but the polarity, range, and function information is latched on the print board by A11IC16 and A11IC17. This is done so that when the EDL function is used the information will not change when the input program is changed.

4-109 The function data is decoded from 10 line to BCD by A11IC13 and latched by A11IC17.

4-110 The data out is inhibited by the AND gate on each set of 4 bits. If neither the $\overline{\text{MDI}}$ or the appropriate $\overline{\text{INHIB}}$ is low, then the data will be present at the output. If either the $\overline{\text{MDI}}$ or the appropriate $\overline{\text{INHIB}}$ is brought LOW the data will be inhibited.

SECTION V
MAINTENANCE

5-1 GENERAL

5-2 This section of the manual contains instructions for periodic maintenance, calibration, troubleshooting and repair of the Model DSM 44 Digital Systems Multimeter.

5-3 TEST EQUIPMENT

5-4 The test equipment required for adjusting and troubleshooting the DSM 44 Digital Systems Multimeter is listed in paragraph 5-15.

5-5 PREVENTATIVE MAINTENANCE

5-6 Careful and regular performance of periodic preventative maintenance will reduce the probability of failure and the need for corrective maintenance.

5-7 INSPECTIONS

5-8 Perform periodic inspections as follows:

PERIOD	AREA OF INSPECTION	ITEMS TO BE CHECKED
Weekly	Exterior of unit, particularly front and rear.	Controls, indicators and connectors for dust and dirt, security of mounting or connection, signs of damage.
Quarterly	Interior of unit including OHMS and AC converters	Electrical parts and wiring (including printed circuit wiring) for dust, dirt, corrosion and evidence of overheating and other damage. Due to the high voltage used in this area, particular attention should be paid to the area around the display circuit board for the accumulation of dust.

5-9 CLEANING

5-10 Remove dust, dirt, and other foreign material using a small brush and vacuum cleaner. Low pressure air may be used if a vacuum cleaner is not available. When using the air, be sure to aim the air stream so that the foreign material will be blown out of the unit rather than into recesses, slots, etc. Use a cloth and a suitable solvent to remove material not removable by means of the above procedure.

CAUTION

Take care not to scratch the printed circuit wiring if it is necessary to brush or rub it to remove foreign material. Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Avoid chemicals which contain benzine, toluene, xylene, acetone or similar solvents. If solvent is used, allow all areas to thoroughly air dry prior to placing instrument in use.

5-11 LUBRICATION

5-12 No lubrication is required.

5-13 PERFORMANCE TEST

5-14 The performance test consists of removing normal inputs to the multimeter and performing the acceptance tests of paragraph 2-15 of this manual.

5-15 TEST EQUIPMENT REQUIRED

5-16 The test equipment required to trouble shoot or calibrate the DSM 44 Digital Systems Multimeter is listed in Table 5-1.

Table 5-1. Required Test Equipment

ITEM	MFR. AND MODEL NO.	TOLERANCE
2 DC Voltage Standards	COHU 351 or equivalent	
AC Voltage Standard	HP 745/746 or equivalent	
Four-Terminal Resistance Standards	Decade values from 10 ohms to 10 megohms	±0.005%
Variable output transformer	Superior Electric Model 216 Variac or equivalent	

5-17 TROUBLESHOOTING

WARNING

HIGH VOLTAGE (200 VDC)

This equipment is powered by and generates potentially lethal voltages.

DEATH

on contact may result if personnel fail to observe safety precautions. Do not touch electronic circuits when power is applied. Avoid contact with all input power connections, the high voltage power supply and display modules. Verify that power supply voltages are discharged to safe levels before touching circuitry.

CAUTION

Maintenance should be attempted only by qualified electronic technicians with some training in digital logic techniques and only after a thorough study of the principles of operation described in detail in Section IV.

5-18 As an aid to trouble shooting of the DSM 44 Digital Systems Multimeter, several trouble shooting flow charts have been included in this section. Each deals with a particular type of malfunction. By following the step-by-step procedures therein, the malfunctioning circuit can be isolated. It is recognized that all possible failure modes cannot be anticipated. The technician will be well advised; therefore, to make a thorough study of the principles of operation described in detail in Section IV. The troubleshooting flow charts are listed below in Table 5-2. Troubleshooting will be facilitated by reference to the simplified logic diagrams of Section IV.

Table 5-2. List of Troubleshooting Flow Charts

TEST SERIES	MALFUNCTION
A	Display will not light.
B	Display locked up.
C	Settling or range delay problem.
D	Improper ranging.
E	OHMS converter malfunction.
F	AC converter malfunction.

5-19 GENERAL HINTS AND AIDS TO TROUBLESHOOTING

5-20 Possible sources of small errors that re-calibration will not cure.

1. Non-linearity is most often caused by a current leakage path which could be a leaky FET, leaky capacitor or excessive input current in an amplifier. Another possible cause is a low-level oscillation caused by a defective component. If the BREAK period is wrong it could also cause non-linearity.

2. Will not set + 1 digit or -1 digit. This is normally due to a defective component in either the A1Q20 or A1Q23 circuits. Another possible cause is improper timing of the E_T period.

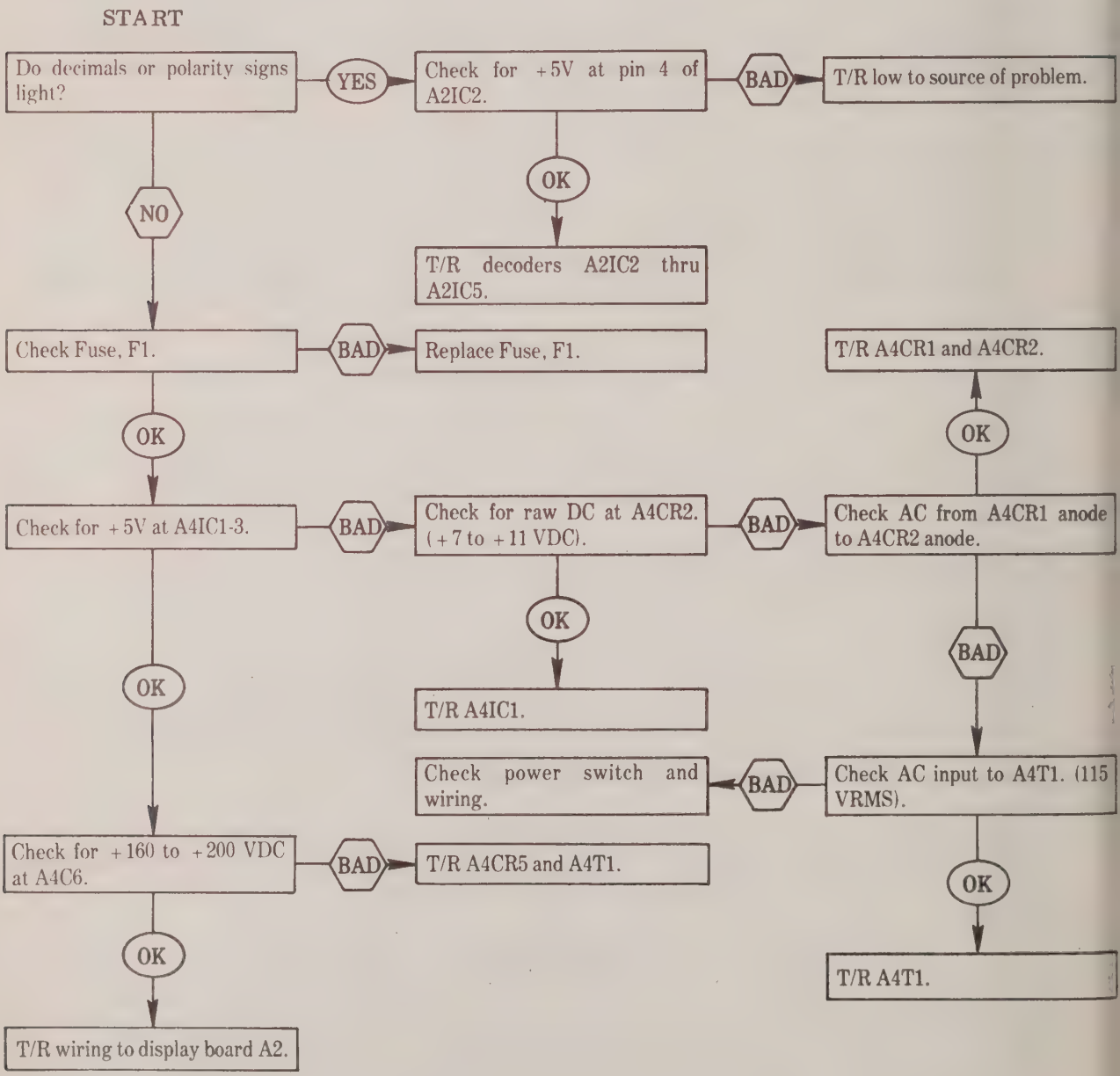
3. Excessive "run around" of readout. The more common causes are a defective amplifier, bad FET or noisy power supply. Sometimes an oscillation due to a defective component will cause this sympton.

4. First reading error after range change. This is normally caused by a mis-adjusted relay. K3 is at fault if the problem occurs when going from 1V to 10V range. K4 is at fault if the problem occurs when going from 10V to lower range. K6 is malfunctioning if the problem occurs when going into DC Ratio. If problems occur, remove cover and adjust relay contacts as required.

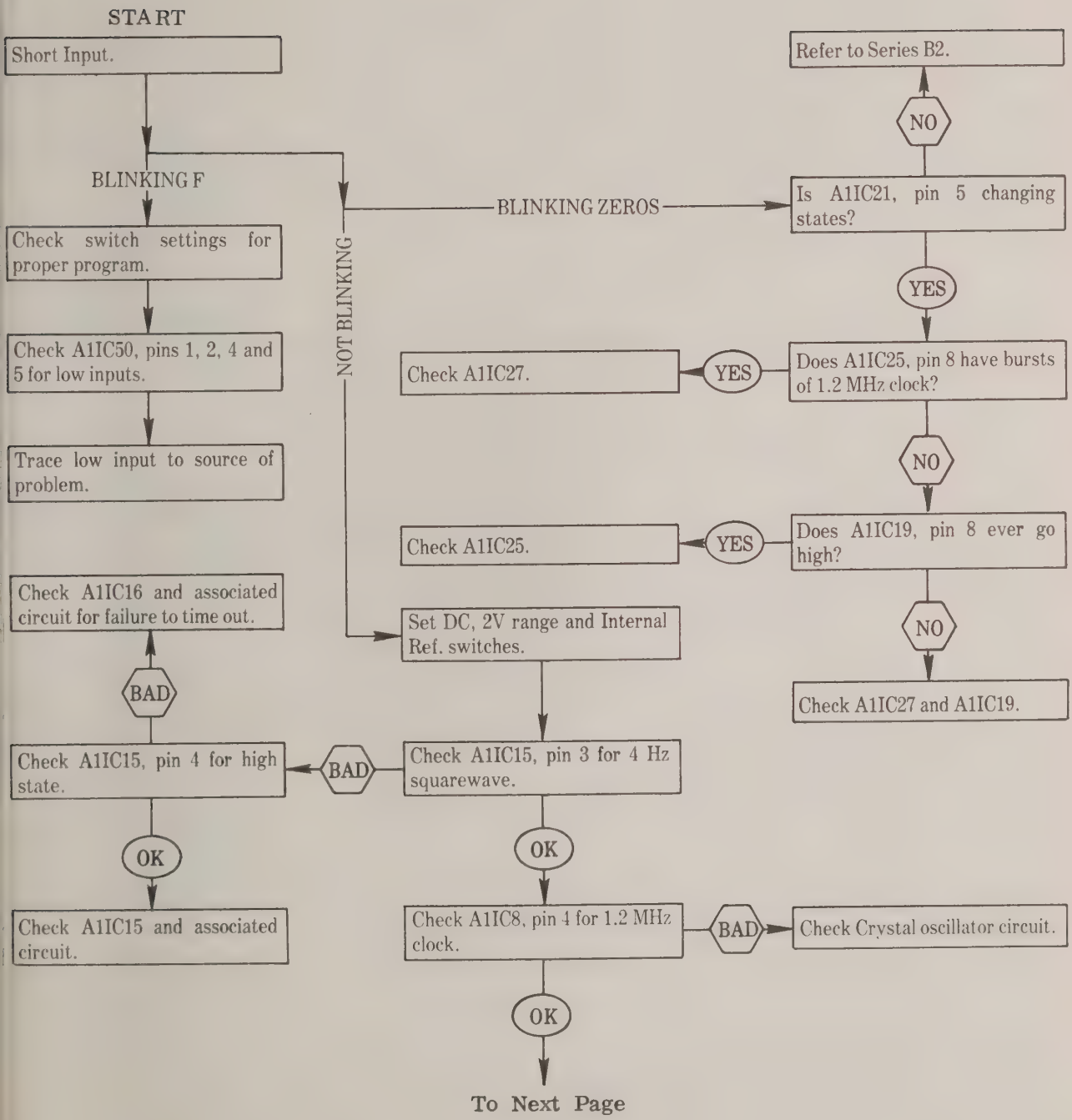
TEST SERIES A
DISPLAY WILL NOT LIGHT

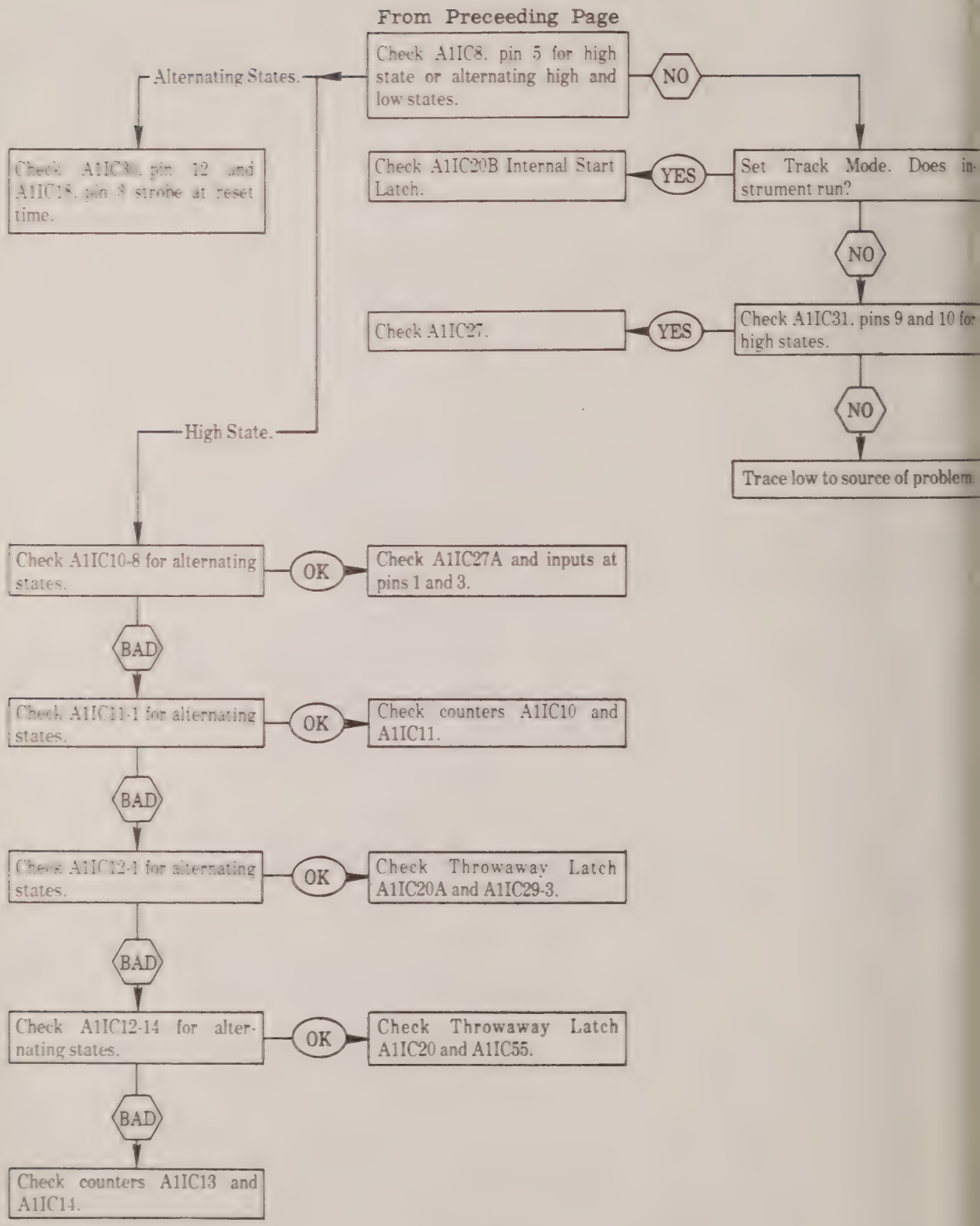
Note: All DC voltage measurements on this chart are referenced to Digital Common (NEG end of 6600 Mfd capacitors next to the main board

Note: T/R Indicates Troubleshoot and Repair.



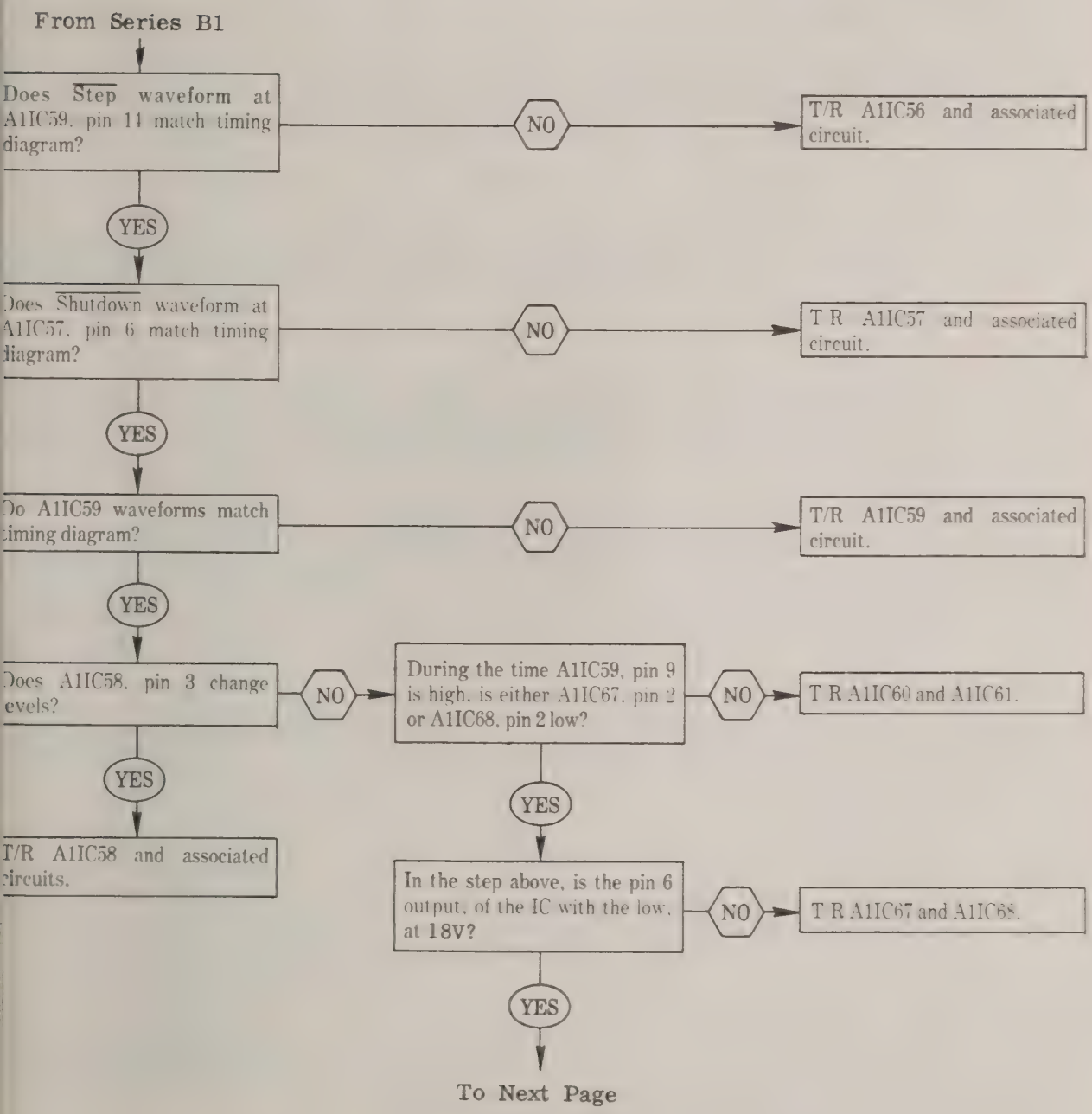
TEST SERIES B1
READING LOCKUP

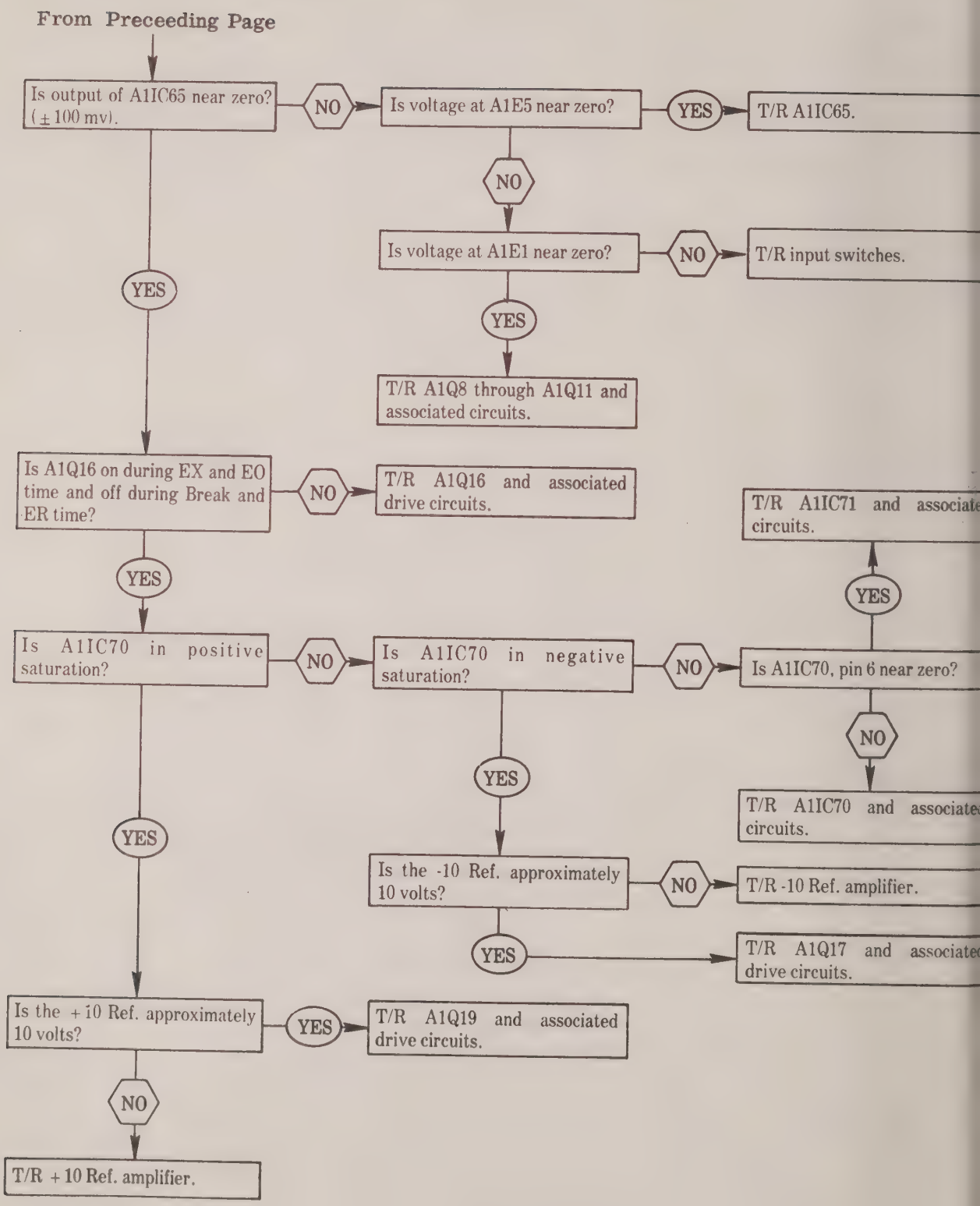



From Preceeding Page
Check A1IC8. pin 5 for high state or alternating high and low states.
NO
Alternating States.
High State.
Check A1IC3. pin 12 and A1IC18. pin 3 strobe at reset time.
Check A1IC20B Internal Start Latch.
YES
Set Track Mode. Does instrument run?
NO
Check A1IC27.
YES
Check A1IC31. pins 9 and 10 for high states.
NO
Trace low to source of problem.
Check A1IC10-8 for alternating states.
OK
Check A1IC27A and inputs at pins 1 and 3.
BAD
Check A1IC11-1 for alternating states.
OK
Check counters A1IC10 and A1IC11.
BAD
Check A1IC12-1 for alternating states.
OK
Check Throwaway Latch A1IC20A and A1IC29-3.
BAD
Check A1IC12-14 for alternating states.
OK
Check Throwaway Latch A1IC20 and A1IC55.
BAD
Check counters A1IC13 and A1IC14.

TEST SERIES B2
CONTINUATION OF READING LOCKUP

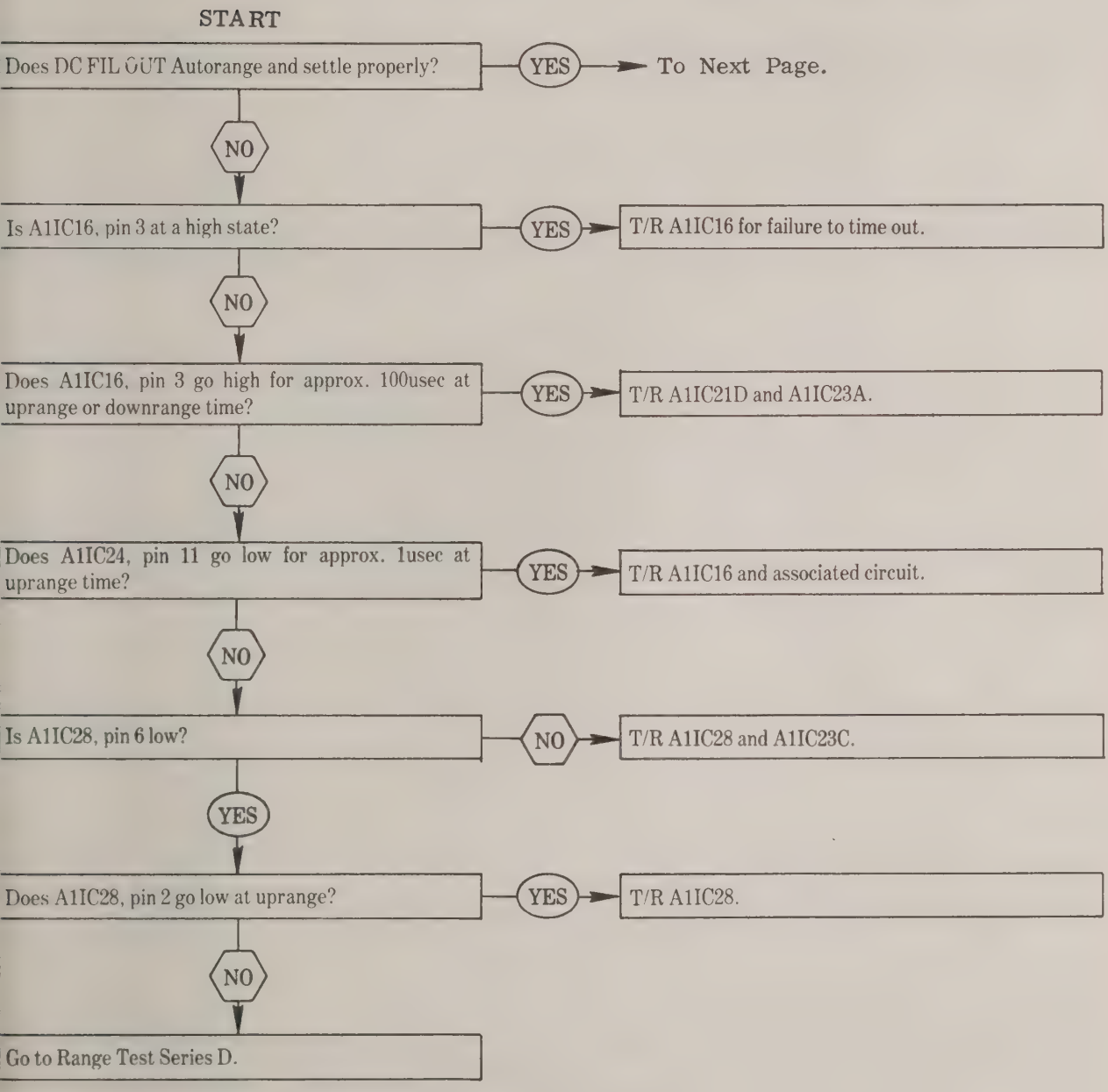
Note: T/R Indicates Troubleshoot and Repair.

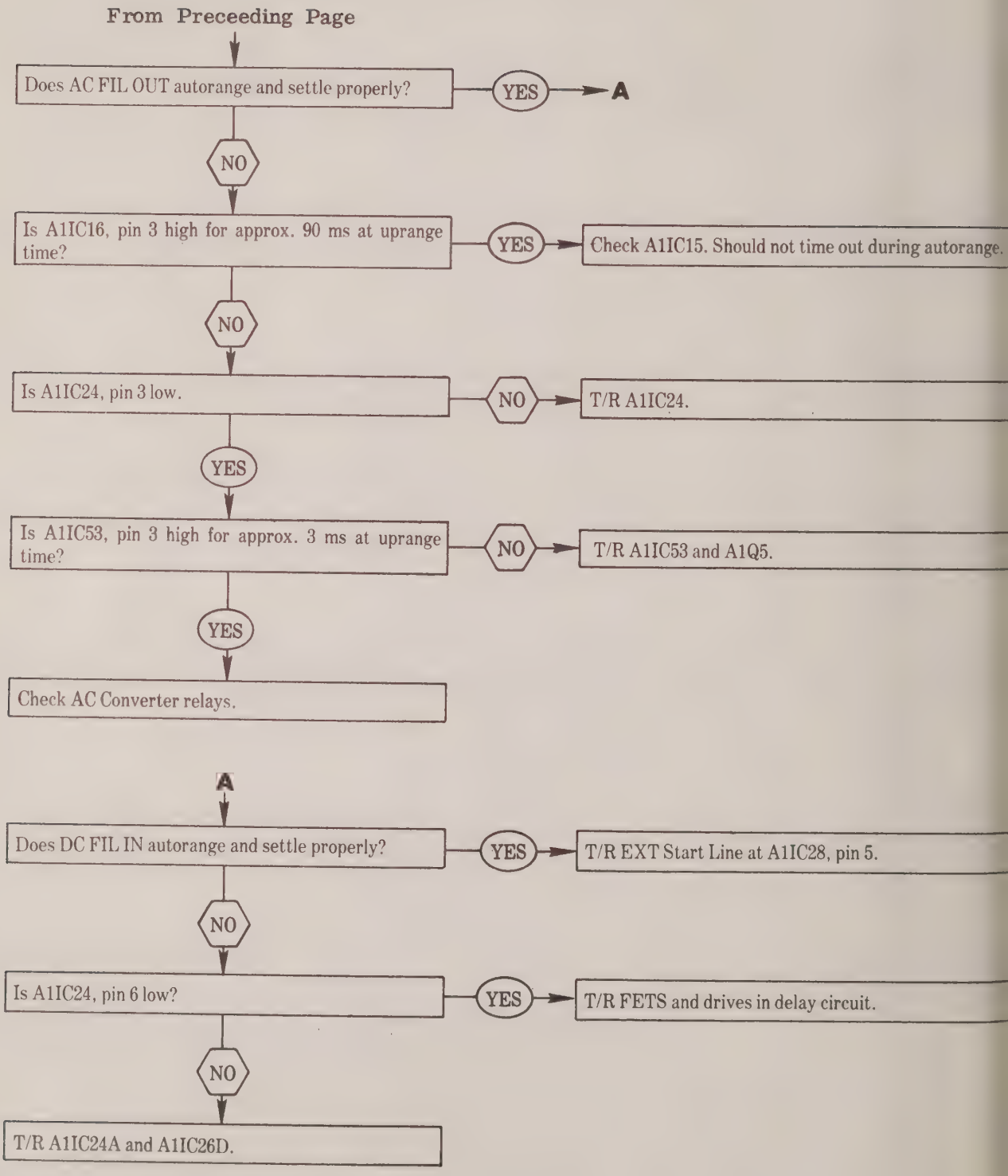

From Series B1
Does Step waveform at A1IC59, pin 11 match timing diagram?
NO
T/R A1IC56 and associated circuit.
YES
Does Shutdown waveform at A1IC57, pin 6 match timing diagram?
NO
T R A1IC57 and associated circuit.
YES
Do A1IC59 waveforms match timing diagram?
NO
T/R A1IC59 and associated circuit.
YES
Does A1IC58, pin 3 change levels?
NO
During the time A1IC59, pin 9 is high, is either A1IC67, pin 2 or A1IC68, pin 2 low?
NO
T R A1IC60 and A1IC61.
YES
T/R A1IC58 and associated circuits.
YES
In the step above, is the pin 6 output, of the IC with the low, at 18V?
NO
T R A1IC67 and A1IC68.
YES
To Next Page


From Preceeding Page
Is output of A1IC65 near zero? (±100 mv).
NO
Is voltage at A1E5 near zero?
YES
T/R A1IC65.
NO
Is voltage at A1E1 near zero?
NO
T/R input switches.
YES
YES
T/R A1Q8 through A1Q11 and associated circuits.
Is A1Q16 on during EX and EO time and off during Break and ER time?
NO
T/R A1Q16 and associated drive circuits.
T/R A1IC71 and associate circuits.
YES
YES
Is A1IC70 in positive saturation?
NO
Is A1IC70 in negative saturation?
NO
Is A1IC70, pin 6 near zero?
NO
YES
T/R A1IC70 and associate circuits.
YES
Is the -10 Ref. approximately 10 volts?
NO
T/R -10 Ref. amplifier.
YES
T/R A1Q17 and associate drive circuits.
Is the +10 Ref. approximately 10 volts?
YES
T/R A1Q19 and associated drive circuits.
NO
T/R +10 Ref. amplifier.

TEST SERIES C
SETTLING OR RANGE DELAY PROBLEM

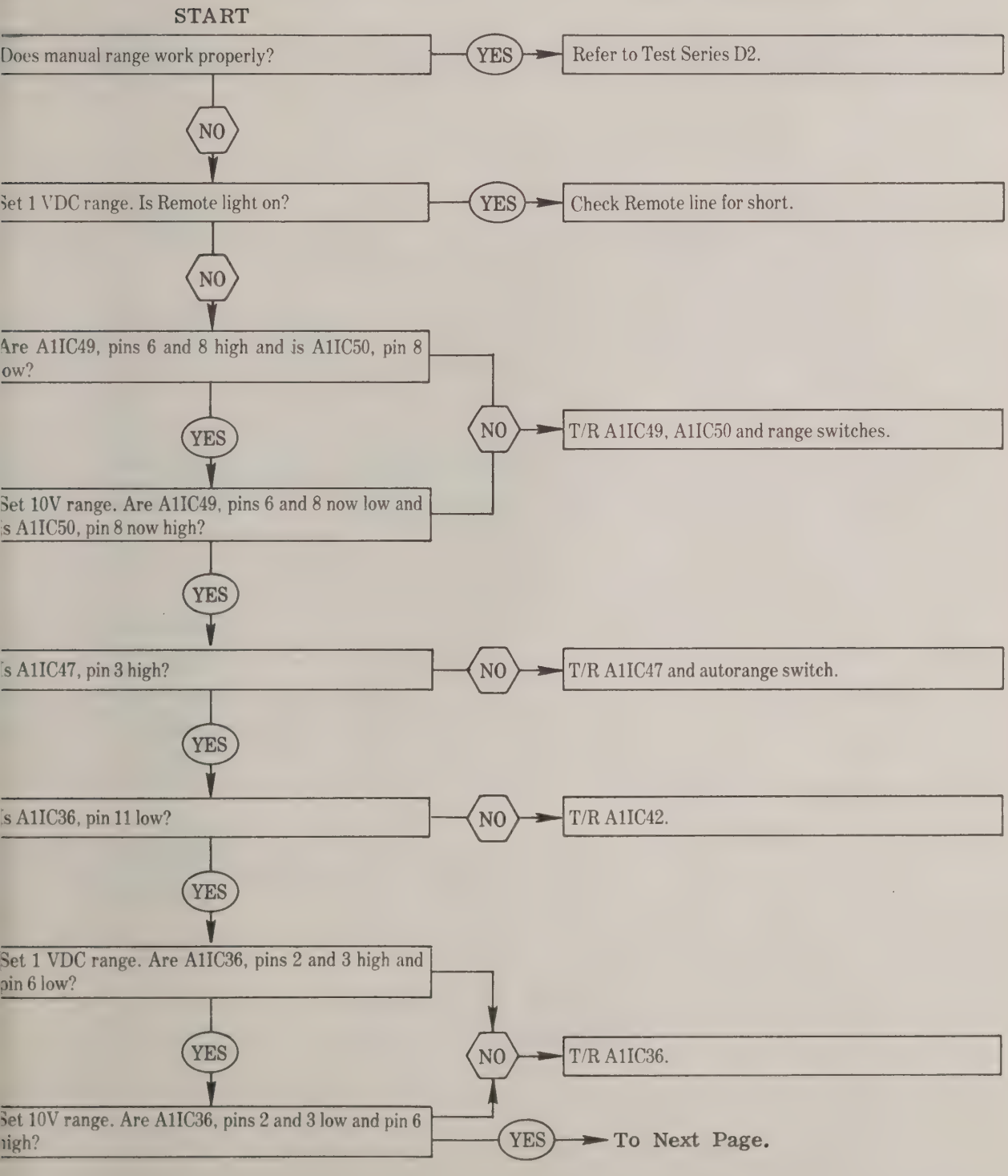
Note: T/R Indicates Troubleshoot and Repair

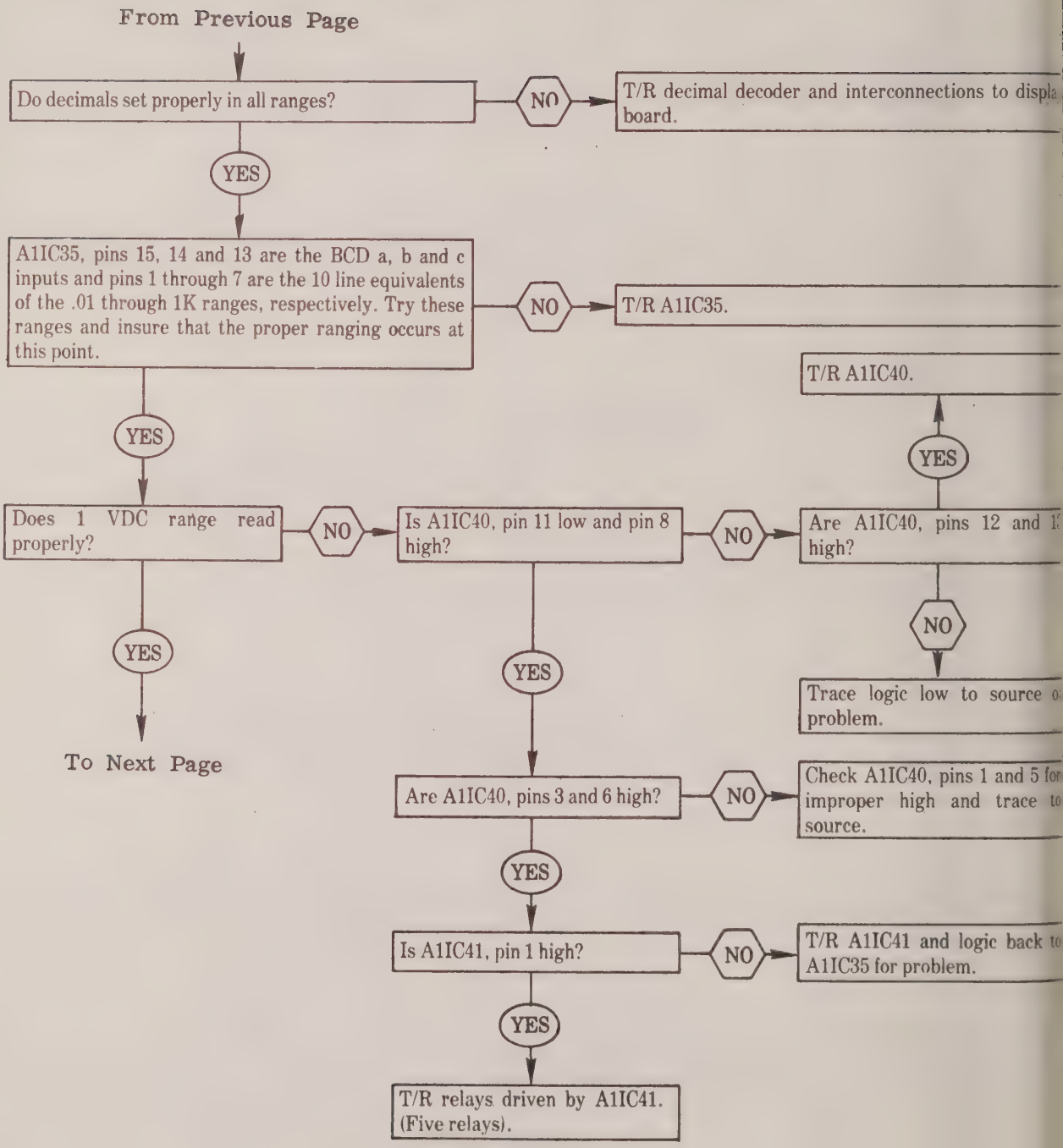



From Preceeding Page
Does AC FIL OUT autorange and settle properly?
YES
A
NO
Is A1IC16, pin 3 high for approx. 90 ms at uprange time?
YES
Check A1IC15. Should not time out during autorange.
NO
Is A1IC24, pin 3 low.
NO
T/R A1IC24.
YES
Is A1IC53, pin 3 high for approx. 3 ms at uprange time?
NO
T/R A1IC53 and A1Q5.
YES
Check AC Converter relays.
A
Does DC FIL IN autorange and settle properly?
YES
T/R EXT Start Line at A1IC28, pin 5.
NO
Is A1IC24, pin 6 low?
YES
T/R FETS and drives in delay circuit.
NO
T/R A1IC24A and A1IC26D.

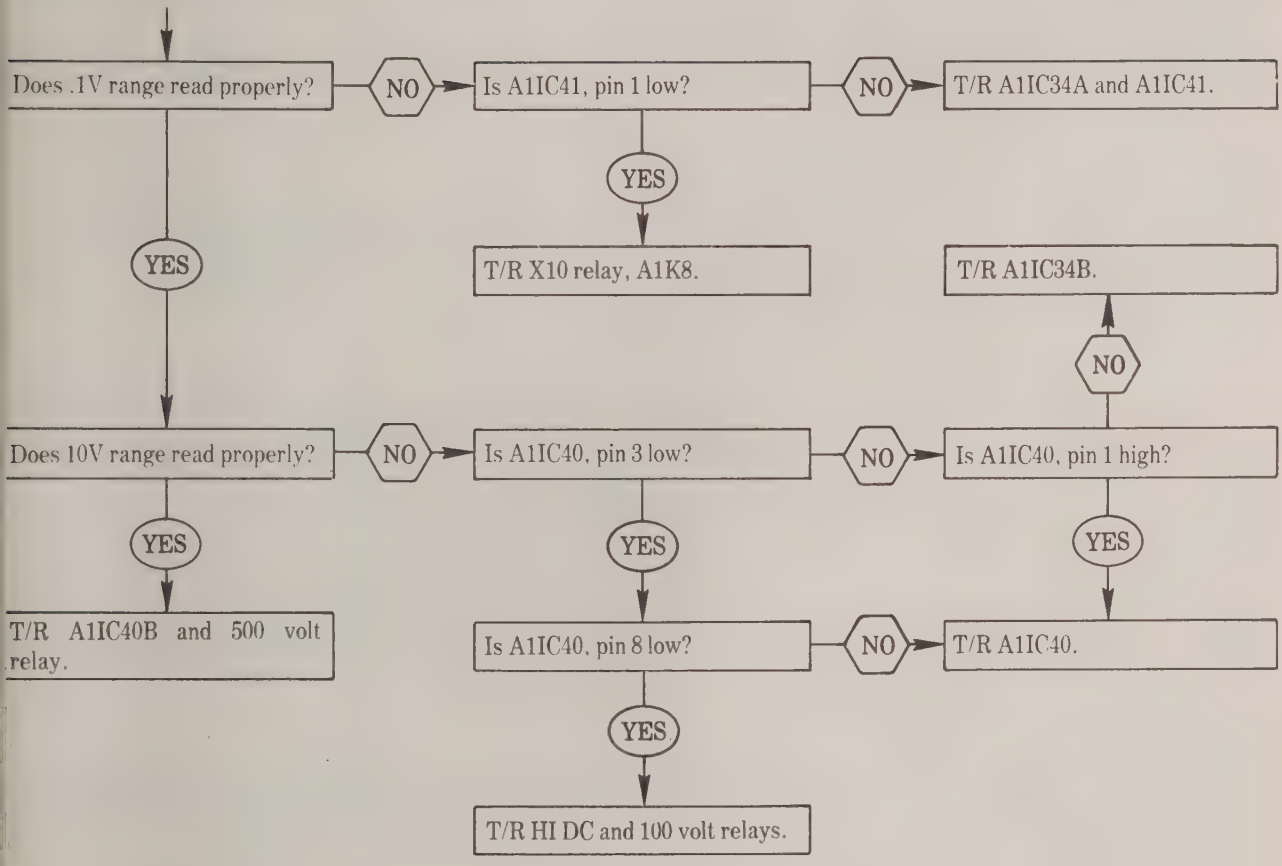
TEST SERIES D1
RANGE PROBLEMS

Note: T/R Indicates Troubleshoot and Repair.


START
Does manual range work properly?
YES
Refer to Test Series D2.
NO
Set 1 VDC range. Is Remote light on?
YES
Check Remote line for short.
NO
Are A1IC49, pins 6 and 8 high and is A1IC50, pin 8 low?
YES
NO
T/R A1IC49, A1IC50 and range switches.
Set 10V range. Are A1IC49, pins 6 and 8 now low and is A1IC50, pin 8 now high?
YES
Is A1IC47, pin 3 high?
NO
T/R A1IC47 and autorange switch.
YES
Is A1IC36, pin 11 low?
NO
T/R A1IC42.
YES
Set 1 VDC range. Are A1IC36, pins 2 and 3 high and pin 6 low?
YES
NO
T/R A1IC36.
Set 10V range. Are A1IC36, pins 2 and 3 low and pin 6 high?
YES
To Next Page.

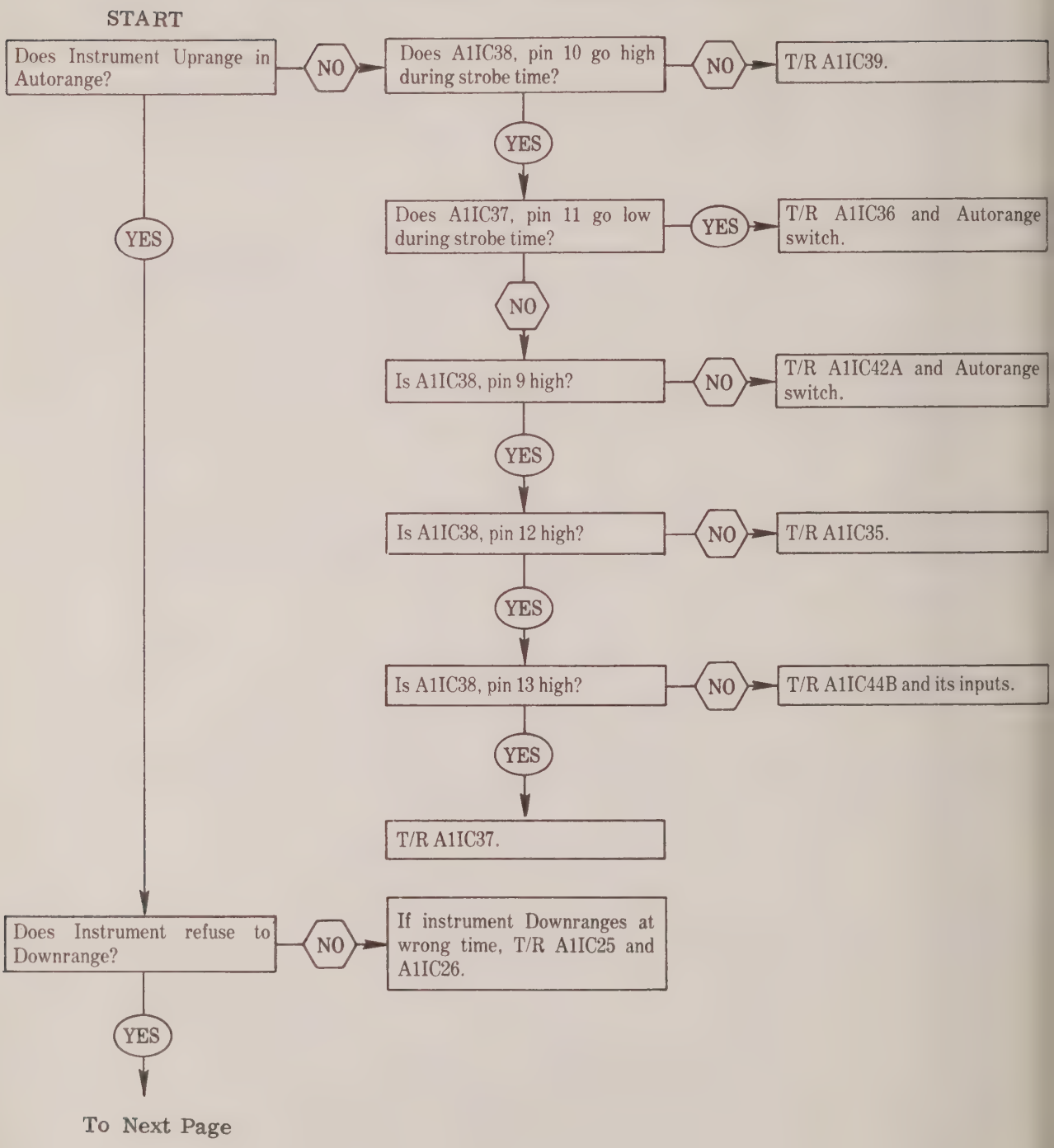

From Previous Page
Do decimals set properly in all ranges?
NO
T/R decimal decoder and interconnections to displa board.
YES
A1IC35, pins 15, 14 and 13 are the BCD a, b and c inputs and pins 1 through 7 are the 10 line equivalents of the .01 through 1K ranges, respectively. Try these ranges and insure that the proper ranging occurs at this point.
NO
T/R A1IC35.
YES
Does 1 VDC range read properly?
NO
Is A1IC40, pin 11 low and pin 8 high?
NO
Are A1IC40, pins 12 and 1 high?
T/R A1IC40.
YES
NO
Trace logic low to source o problem.
YES
To Next Page
YES
Are A1IC40, pins 3 and 6 high?
NO
Check A1IC40, pins 1 and 5 for improper high and trace to source.
YES
Is A1IC41, pin 1 high?
NO
T/R A1IC41 and logic back to A1IC35 for problem.
YES
T/R relays driven by A1IC41. (Five relays).

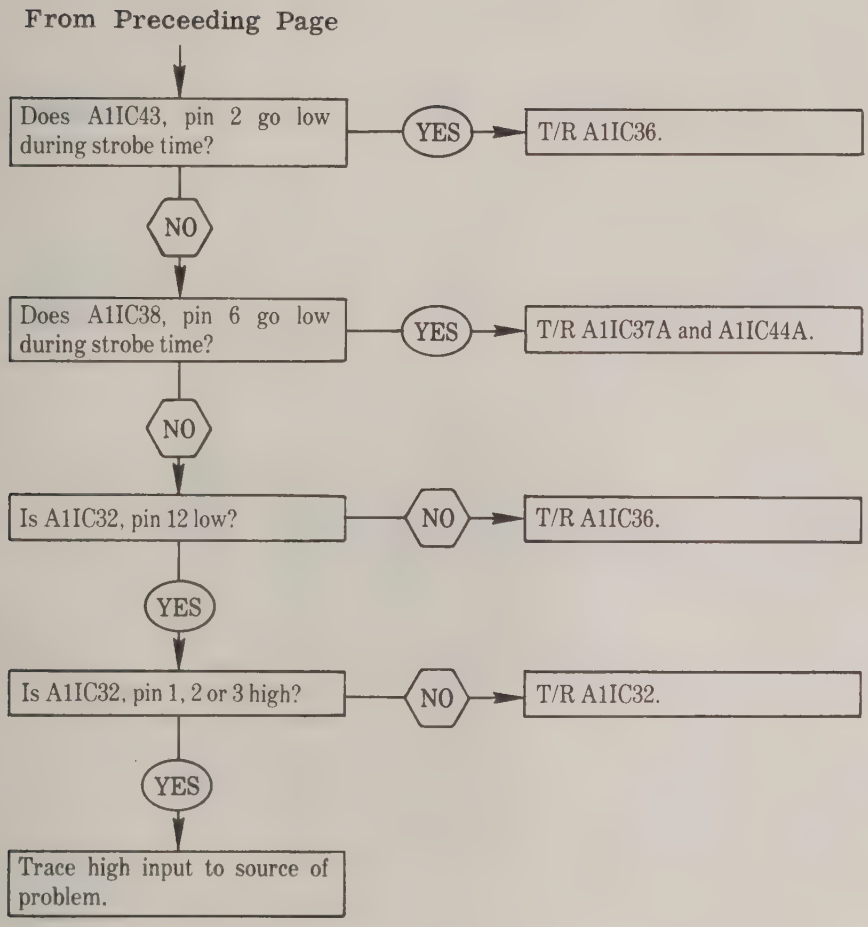
From Preceeding Page



TEST SERIES D2
RANGE PROBLEMS

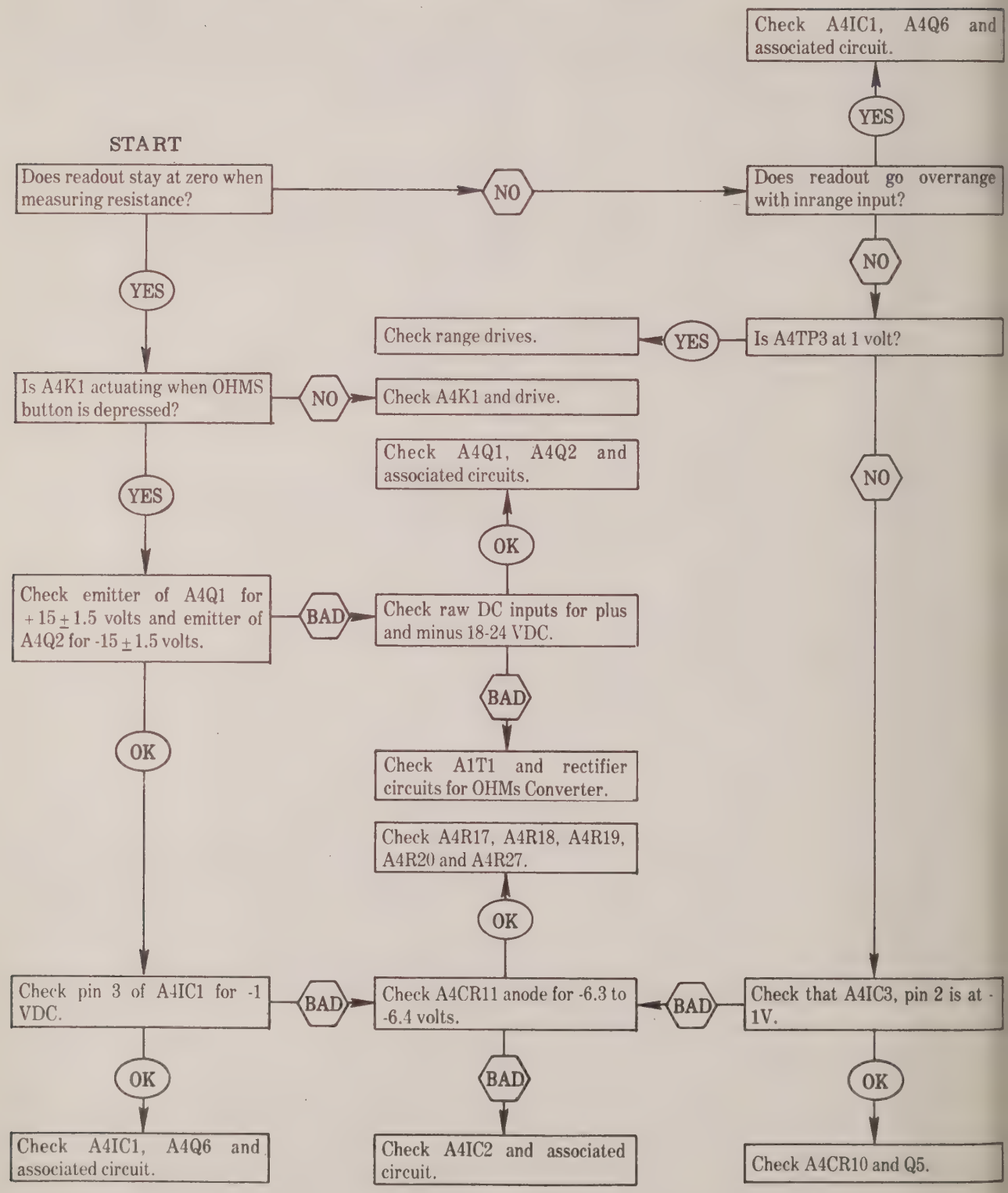
Note: T/R Indicates Troubleshoot and Repair.




From Preceeding Page
Does A1IC43, pin 2 go low during strobe time?
YES
T/R A1IC36.
NO
Does A1IC38, pin 6 go low during strobe time?
YES
T/R A1IC37A and A1IC44A.
NO
Is A1IC32, pin 12 low?
NO
T/R A1IC36.
YES
Is A1IC32, pin 1, 2 or 3 high?
NO
T/R A1IC32.
YES
Trace high input to source of problem.

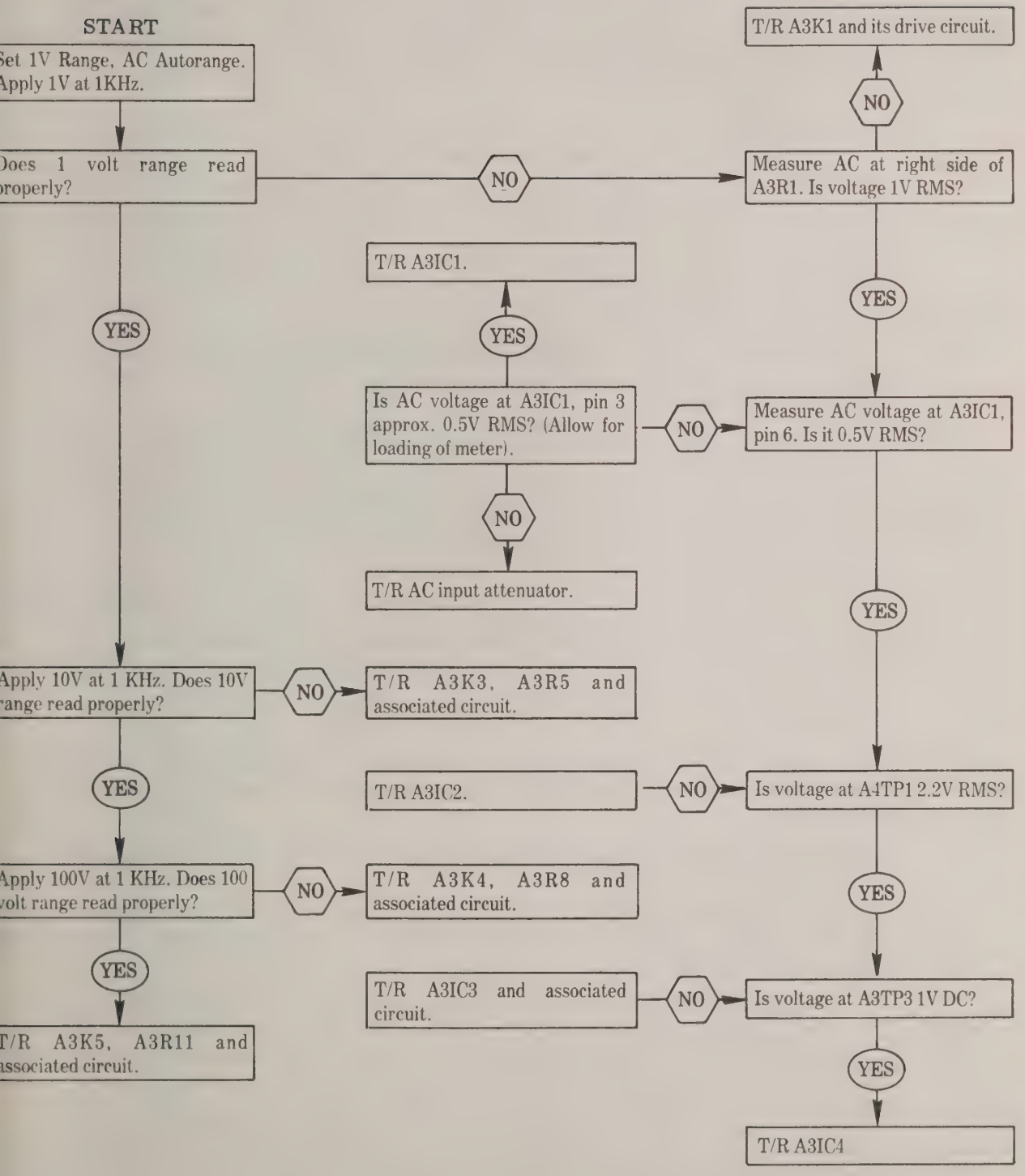
TEST SERIES E
OHMS CONVERTER MALFUNCTION

Note: T/R Indicates Troubleshoot and Repair


START
Does readout stay at zero when measuring resistance?
NO
Does readout go overrange with inrange input?
YES
Check A4IC1, A4Q6 and associated circuit.
NO
Is A4TP3 at 1 volt?
YES
Check range drives.
YES
Is A4K1 actuating when OHMS button is depressed?
NO
Check A4K1 and drive.
NO
Check A4Q1, A4Q2 and associated circuits.
OK
Check emitter of A4Q1 for +15 ± 1.5 volts and emitter of A4Q2 for -15 ± 1.5 volts.
BAD
Check raw DC inputs for plus and minus 18-24 VDC.
BAD
Check A1T1 and rectifier circuits for OHMs Converter.
OK
Check A4R17, A4R18, A4R19, A4R20 and A4R27.
OK
Check pin 3 of A4IC1 for -1 VDC.
BAD
Check A4CR11 anode for -6.3 to -6.4 volts.
BAD
Check that A4IC3, pin 2 is at -1V.
OK
BAD
OK
Check A4IC1, A4Q6 and associated circuit.
Check A4IC2 and associated circuit.
Check A4CR10 and Q5.

TEST SERIES F
AC CONVERTER MALFUNCTION

Note: T/R Indicates Troubleshoot and Repair.



5-21 CALIBRATION PROCEDURE

5-22 The following calibration procedure require the use of the test equipment listed in Table 5-2. Use the chart on the bottom of the top cover of the DSM 44, or the call outs on the shields of the individual converters, to locate the adjustments. Allow 30 minutes warm-up before starting calibration. All calibration must be accomplished in sequence shown.

5-23 DC CALIBRATION

5-24 4 wire bipolar board. Perform the following steps if A10 board is installed.

1. Select EXT DC reference and apply -1 volt to REF input terminals. Monitor A10 TP1 with a DMM. Adjust A10R9 for +1.0000 volt on DMM. (Connect DMM LO to A10TP3.)
2. Raise REF input voltage to -10 volts and adjust A10R10 for +10.000 volts on DMM.
3. Repeat steps 1 and 2 as required to compensate for interaction.
4. Apply +1 volt to reference inputs and adjust A10R17 for +1.0000 volt on DMM readout.
5. Raise REF input voltage to +10 volts and adjust A10R13 for +10.000 on DMM.
6. Repeat steps 4 and 5 as required to compensate for interaction.

5-25 MAINFRAME DC CALIBRATION

5-26 Perform the following steps. If A10 is installed, apply -Ref in steps 5 thru 8.

1. Short input signal leads, select DC function, internal ref, filter out, 20 volt range. Adjust A1R81 until polarity sign flips plus and minus.
2. Select 200mv range and adjust A1R63 until polarity sign flips plus and minus.
3. Connect a 1 megohm resistor from signal HI to signal LOW. Adjust A1C28 until polarity sign flips plus and minus. Remove 1 megohm resistor.
4. Short input leads and select the 2V range. Adjust A1C31 until polarity sign flips plus and minus.
5. Select external DC reference, 2 volt range. Apply + 10 volt reference and -1mv signal. Connect jumper from Blk to Blue binding post. Adjust A1R for -.0010 on readout.
6. Increase signal input to -1 volt adjust A1R121 for -1.0000 on readout.
7. Decrease reference voltage to + 2V and signal input to -.2V. Adjust A1R9 for -1.0000 on readout.
8. Repeat steps 5, 6 and 7 as required to correct for interaction.
9. Increase reference input to + 10V and apply + 1mv signal. Adjust A1R124 for + .0010 on readout.
10. Increase signal input to + 1 volt. Adjust A1R104 for + 1.0000 on readout.

11. Reduce reference input to +2V and signal input to +.2 volt. Adjust A1R108 for +1.0000 on readout.

12. Repeat steps 9, 10 and 11 as required to correct for interaction.

13. Select internal reference and apply -1V signal. Remove jumper installed in Step 5. Adjust A1R99 for -1.0000 on readout.

14. Select autorange and apply -.1 volt to signal input. Adjust A1R110 for -100.00 on readout.

15. Increase signal input to -10 volts. Adjust A1R75 for -10.000 on readout.

16. Increase signal input to -400 volts. Adjust A1R74 for -400.0 on readout.

5-27 AC CALIBRATION (Average responding)

5-28 Perform the following steps in sequence. Note: Steps A, B and C need only be accomplished if a component in the AC converter has been replaced or if one of the steps in the remainder of the procedure does not result in the specified readout.

A. Short input leads, select AC function 500V range. Remove top shield, monitor A3TP1 with external DMM. Adjust A3R17 for zero ±50μv on external DMM. Connect external DMM from A3TP1 to A3TP4.

B. Switch to 2V range and adjust A3R14 for zero ±50μv on external DMM.

C. Short TP2 to TP4. Monitor TP3 with external DMM. Adjust A3R34 for zero on external DMM. Remove short, external DMM and replace top shield on AC converter.

1. Select autorange filter in, and apply 1mv at 100 Hz to input leads. Adjust A3R23 for .0010 on readout. Reading should increase clockwise.

2. Apply 1V at 100 Hz to input leads. Adjust A3R22 for 1.0000 on readout.

3. Apply 400V at 100 Hz to input leads. Adjust A3R12 for 400.0 on readout.

4. Apply 400V at 10 KHz to input leads. Adjust A3C2 for 400.0 on readout.

5. Apply 1V at 10 KHz to input leads. Adjust A3C5 for 1.0000 on readout.

6. Apply 10V at 100 Hz to input leads. Adjust A3R6 for 10.000 on readout.

7. Apply 10V at 10 KHz to input leads. Adjust A3C7 for 10.000 on readout.

8. Apply 100V at 100 Hz to input leads. Adjust A3R9 for 100.00 on readout.

9. Apply 100V at 10 KHz to input leads. Adjust A3C10 for 100.00 on readout.

5-29 OHMS CONVERTER CALIBRATION

5-30 Perform the following steps in sequence. Note: steps A and B need only be done if a component in the OHMS converter has been replaced or if one of the steps in the remainder of the procedure will not adjust properly.

A. Remove top shield, short yellow and blue leads and connect an external DMM from TP2 (LO) to TP1 (HI). Adjust A4R31 for -10.000V, ±1mv.

B. Move external DMM HI to TP3 (summing junction) and adjust A4R17 for -1.0000V±100μV. Remove external DMM and replace converter shield.

1. Select autorange, OHMS function and connect a precision 10 megohm standard across input leads. (see Figure 3-3 for proper connections.) Adjust A4R22 for 10000. on readout.
2. Connect a precision, 4-wire 10 ohm standard across input leads. Adjust A4R7 for 10.000. on readout.
3. Connect a precision 1K ohm standard across input leads. Adjust A4R10 for 1.0000 on readout.
4. Connect a precision 10K ohm standard across input leads. Adjust A4R12 for 10.000 on readout.
5. Connect a precision 100K ohm standard across input leads. Adjust A4R14 for 100.00 on readout.
6. Connect a precision 1 megohm standard across input leads. Adjust A4R16 for 1000.0 on readout.

5-31 AC EXTERNAL REFERENCE CALIBRATION (Average Responding)

5-32 Perform the following steps if AC reference installed. Step A will not normally be required on a re-calibration.

A. Calibrate the signal converter as per paragraph 5-27. Place AC reference converter in signal converter position and calibrate using paragraph 5-27. Return reference converter to its normal position and replace the signal converter.

1. Set reference converter range switch to PROGRAM and select the 2VAC range and EXT AC reference position. Apply 1V at 100 Hz to both red and yellow input terminals. Connect the low side of the input signal to the black input terminal. Adjust A9R2 for 1.0000 on readout.
2. Reduce input to .1V at 100 Hz and adjust reference converter R23 for 1.0000 on readout.
3. Repeat Steps 1 and 2 to compensate for interaction
4. Select the 500V AC range and apply 400V at 100 Hz to both inputs and adjust reference converter R12 for 1000.0 on readout.
5. Apply 400V at 10K Hz to both inputs and adjust reference converter C2 for 1.0000 on readout.
6. Select 2V range and apply 1V at 10K Hz to both inputs. Adjust reference converter C5 for 1.0000 on readout.

7. Select 20V range and apply 10V at 100Hz to both inputs. Adjust reference converter R6 for 10.000 on readout.

8. Apply 10V at 10K Hz to both inputs. Adjust reference converter for 10.000 on readout.

9. Select the 200V range and apply 100V at 100Hz to both inputs. Adjust reference converter R9 for 100.00 on readout.

10. Apply 100V at 10K Hz to both inputs. Adjust reference converter C10 for 100.00 on readout.

5-33 VERIFICATIONS OF SPECIFICATIONS

5-34 The following verification procedures should be performed only after completion of the calibration procedures.

5-35 INPUT IMPEDANCE

5-36 Select the .2 volt DC range and filter in. Apply +.1V DC to the input terminals and observe the reading on the display. Connect a 1M ohm 1% resistor in series with the high lead. The resistor in/out readings should not vary more than 10 digits.

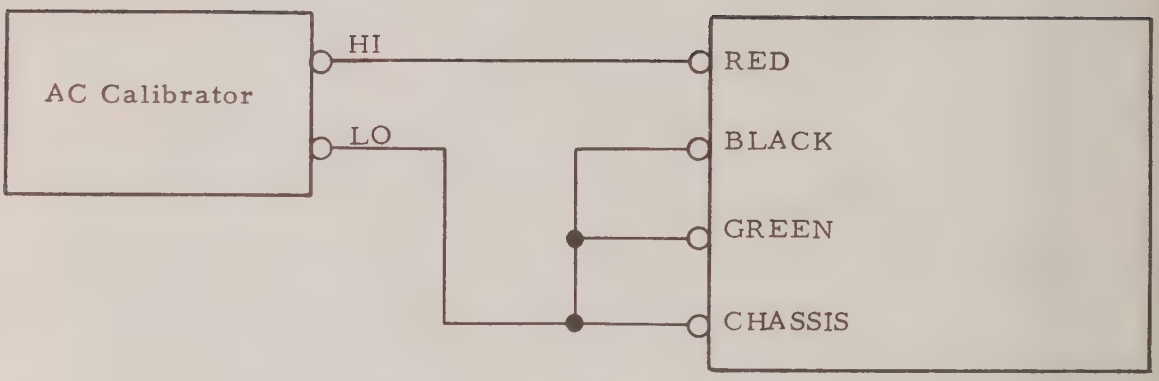
5-37 NORMAL MODE REJECTION

5-38 Select the .2V DC range filter out. Connect the red input lead to the high output terminal of the HP745A and the black and green input leads to the low terminal, see Figure 5-1. Adjust the HP745A to .3535 volts at exactly 60Hz. the DSM 44 display should indicate .0000 ±5 digits.

5-39 With the same connections as the previous step, select filter in and increase the input voltage to 2.22V. The DSM 44 display should indicate .0000 ±5 digits.

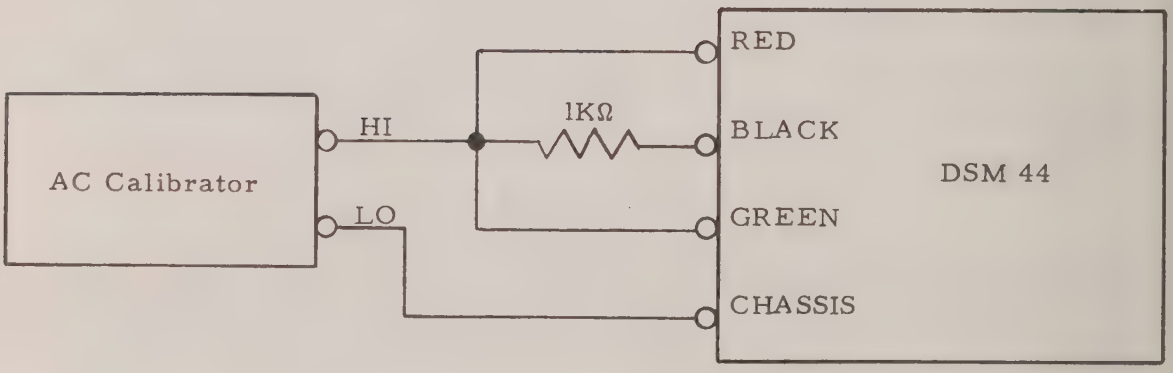
5-40 COMMON MODE REJECTION

5-41 Select the .2V DC range. Connect the red and green input leads together at the high terminal of the HP745A and connect the black input lead through a 1KΩ resistor to the same point. Connect the chassis of the DSM 44 to the low terminal of the HP745A, see Figure 5-2. Adjust the voltage to 11.18 volts at exactly 60Hz. The DSM 44 readout should indicate .0000 ±5 digits.



Circuit For Normal Mode Rejection Test

Figure 5-1



Circuit For Common Mode Rejection Test

Figure 5-2

SECTION VI
DIAGRAMS

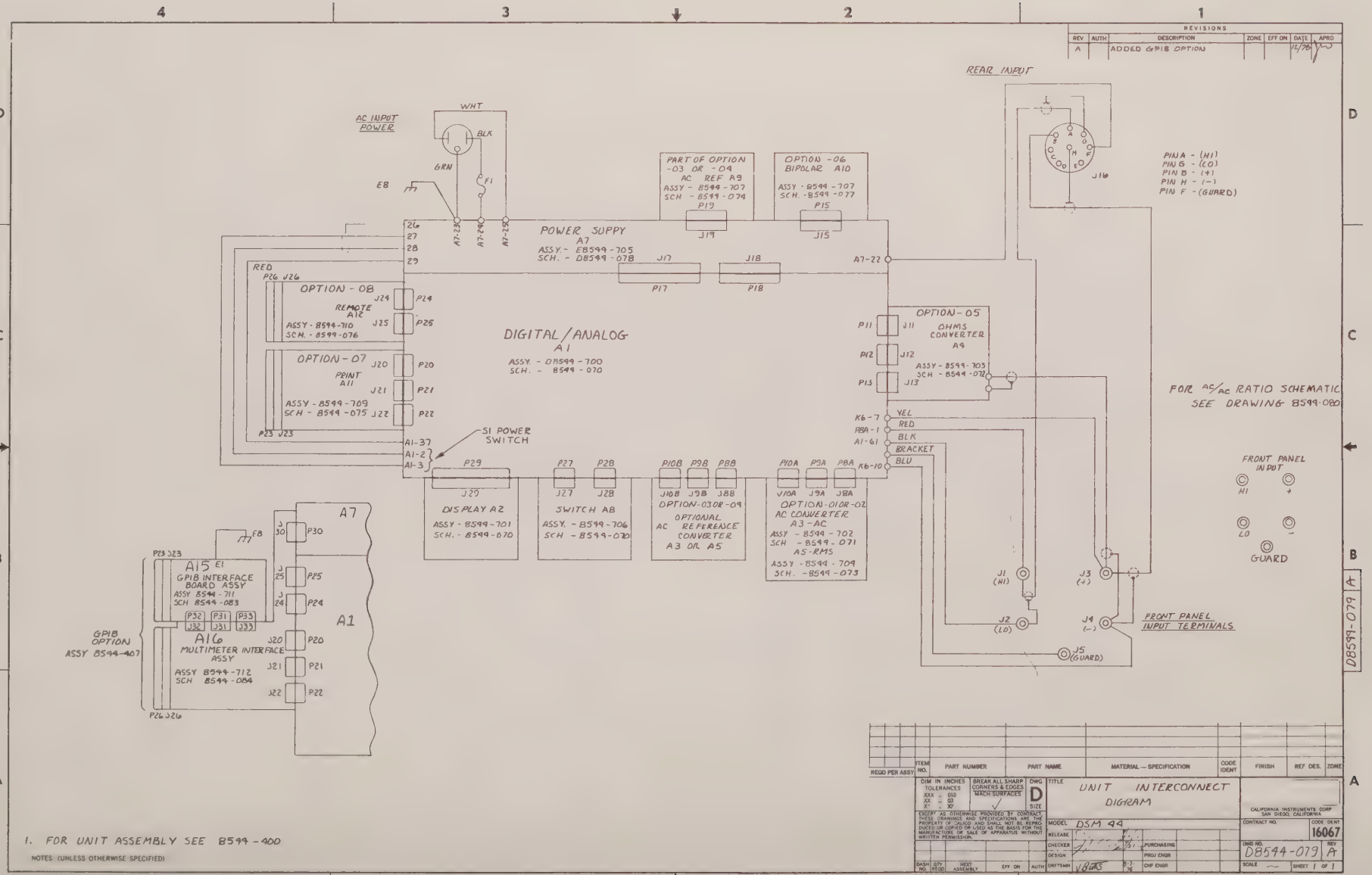
6-1 GENERAL

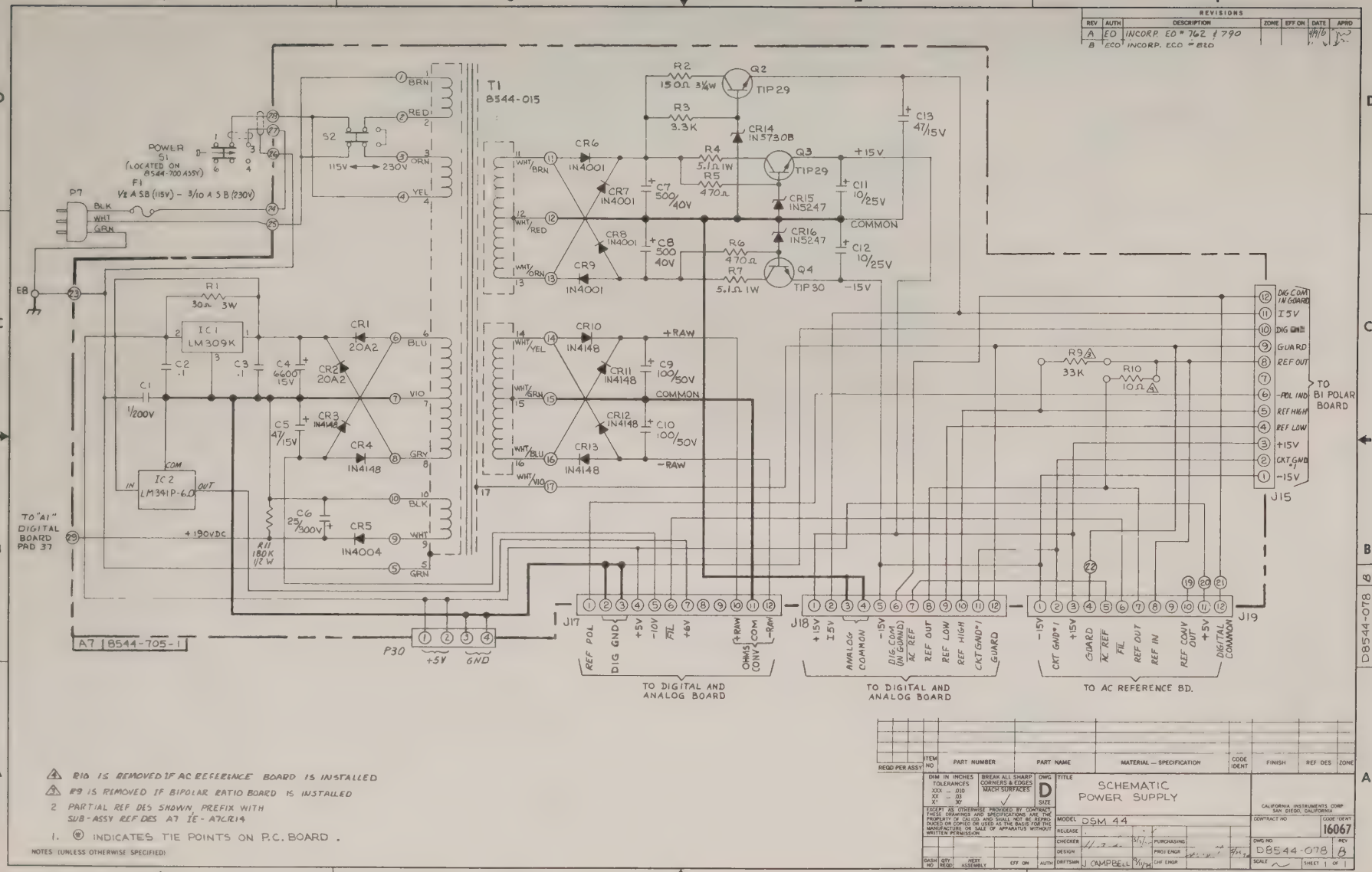
6-2 This section of the manual contains schematic and mechanical diagrams necessary for operation and maintenance of the Model DSM 44 Digital Multimeter. The schematic diagrams illustrate the circuit while the mechanical assemblies indicate the component locations.

6-3 REFERENCE DESIGNATIONS

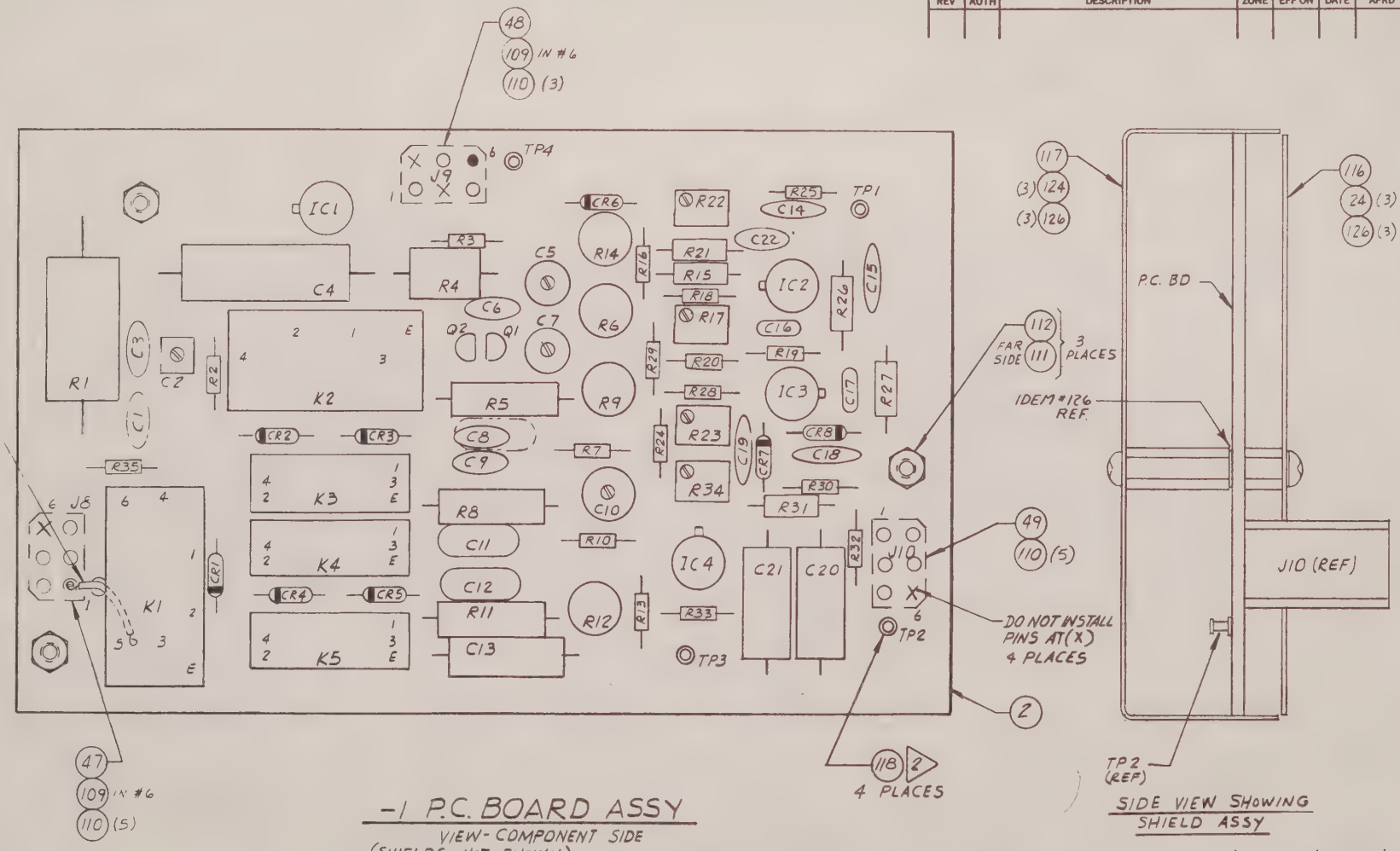
6-4 Partial reference designators are shown on schematic and mechanical drawings. Prefix these reference designators with assembly and/or sub-assembly designation for the complete reference designator. For example:

Assembly/Sub-Assembly	Component	Component Designation
None	J3	J3
A1	IC4	A1IC4
A2	Q3	A2Q3
A3	C7	A3C7
A4	Q2	A4Q2


REVISIONS
REV | AUTH | DESCRIPTION | ZONE | EFF ON | DATE | APRD
A | | ADDED GPIB OPTION | | | 12/78
REAR INPUT
AC INPUT POWER
WHT
BLK
GRN
E8
F1
A7-23
A7-24
A7-25
PART OF OPTION -03 OR -04 AC REF A9
ASSY - 8599-707
SCH - 8599-074
P19
J19
OPTION -06 BIPOLAR A10
ASSY - 8599-707
SCH. 8599-077
P15
J15
J16
PIN A - (HI)
PIN G - (LO)
PIN B - (+)
PIN H - (-)
PIN F - (GUARD)
POWER SUPPY
A7
ASSY. - EB599-705
SCH. - D8599-078
J17
J18
P17
P18
A7-22
RED
P26 J26
OPTION - 08
REMOTE A12
ASSY - 8599-710
SCH. - 8599-076
J24
J25
P24
P25
OPTION - 07
PRINT A11
ASSY - 8599-709
SCH - 8599-075
J20
J21
J22
P20
P21
P22
P23 J23
DIGITAL/ANALOG
A1
ASSY. - D8599-700
SCH. - 8599-070
A1-37
A1-2
A1-3
S1 POWER SWITCH
OPTION - 05
OHMS CONVERTER A9
ASSY - 8599-703
SCH - 8599-072
P11
P12
P13
J11
J12
J13
K6-7
P8A-1
A1-61
K6-10
YEL
RED
BLK
BRACKET
BLU
FOR AC/ac RATIO SCHEMATIC SEE DRAWING 8599-080
FRONT PANEL INPUT
HI
+
LO
-
GUARD
P29
J29
DISPLAY A2
ASSY - 8599-701
SCH. - 8599-070
P27
P28
J27
J28
SWITCH A8
ASSY. - 8599-706
SCH - 8599-070
P10B
P9B
P8B
J10B
J9B
J8B
OPTION-03 OR-04
OPTIONAL AC REFERENCE CONVERTER
A3 OR A5
P10A
P9A
P8A
J10A
J9A
J8A
OPTION-01 OR-02
AC CONVERTER A3-AC
ASSY - 8599-702
SCH - 8599-071
A5-RMS
ASSY - 8599-709
SCH. - 8599-073
J1 (HI)
J2 (LO)
J3 (+)
J4 (-)
J5 (GUARD)
FRONT PANEL INPUT TERMINALS
A7
J30
P30
F8
P23 J23
A15 E1
GPIB INTERFACE BOARD ASSY
ASSY 8544-711
SCH 8544-083
P32
P31
P33
J32
J31
J33
GPIB OPTION ASSY 8544-407
A16
MULTIMETER INTERFACE ASSY
ASSY 8544-712
SCH 8544-084
J25
J24
J20
J21
J22
P25
P24
P20
P21
P22
A1
P26 J26
D8599-079 A
1. FOR UNIT ASSEMBLY SEE 8599-400
NOTES (UNLESS OTHERWISE SPECIFIED)
ITEM NO. | PART NUMBER | PART NAME | MATERIAL — SPECIFICATION | CODE IDENT | FINISH | REF DES. | ZONE
REQD PER ASSY
DIM IN INCHES TOLERANCES XXX ± .010 XX ± .03 X° ± 30'
BREAK ALL SHARP CORNERS & EDGES MACH SURFACES √
DWG SIZE D
EXCEPT AS OTHERWISE PROVIDED BY CONTRACT THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALICO AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION.
TITLE UNIT INTERCONNECT DIAGRAM
MODEL DSM 44
RELEASE
CHECKER
DESIGN
DRFTSMN
PURCHASING
PROJ ENGR
CHF ENGR
CALIFORNIA INSTRUMENTS CORP SAN DIEGO, CALIFORNIA
CONTRACT NO.
CODE IDENT 16067
DWG NO. D8544-079
REV A
SCALE —
SHEET 1 OF 1
DASH NO. | QTY REQD | NEXT ASSEMBLY | EFF ON | AUTH
CALICO P-148


REVISIONS
REV AUTH DESCRIPTION ZONE EFF ON DATE APRD
A EO INCORP. EO # 762 & 790 4/9/76
B ECO INCORP. ECO # 810
T1 8544-015
POWER S1 (LOCATED ON 8544-700 ASSY)
F1 1/2 A SB (115V) - 3/10 A SB (230V)
S2
115V ↔ 230V
P7
BLK
WHT
GRN
R1 30Ω 3W
IC1 LM309K
IC2 LM341P-6.0
C1 1/200V
C2 .1
C3 .1
C4 6600 15V
C5 47/15V
C6 25/300V
R11 180K 1/2W
CR1 20A2
CR2 20A2
CR3 IN4148
CR4 IN4148
CR5 IN4004
+190VDC
TO "A1" DIGITAL BOARD PAD 37
A7 8544-705-1
P30 +5V GND
R2 150Ω 3¼W
Q2 TIP29
R3 3.3K
CR14 IN5230B
C13 47/15V
CR6 IN4001
CR7 IN4001
CR8 IN4001
CR9 IN4001
R4 5.1Ω 1W
R5 470Ω
C7 500/40V
C8 500 40V
Q3 TIP29
+15V
C11 10/25V
CR15 IN5247
COMMON
CR16 IN5247
C12 10/25V
R6 470Ω
R7 5.1Ω 1W
Q4 TIP30
-15V
CR10 IN4148
CR11 IN4148
CR12 IN4148
CR13 IN4148
+RAW
C9 100/50V
COMMON
C10 100/50V
-RAW
R9 33K
R10 10Ω
TO BI POLAR BOARD
J15
DIG COM IN GUARD
I5V
DIG COM
GUARD
REF OUT
-FDL IND
REF HIGH
REF LOW
+15V
CKT GND
-15V
J17
REF POL
DIG GND
+5V
-10V
FIL
+6V
+RAW COM
OHMS CONV
-RAW
TO DIGITAL AND ANALOG BOARD
J18
+15V
I5V
ANALOG COMMON
-15V
DIG COM (IN GUARD)
AC REF
REF OUT
REF LOW
REF HIGH
CKT GND #1
GUARD
TO DIGITAL AND ANALOG BOARD
J19
-15V
CKT GND #1
+15V
GUARD
AC REF
FIL
REF OUT
REF IN
REF CONV OUT
+5V
DIGITAL COMMON
TO AC REFERENCE BD.
R10 IS REMOVED IF AC REFERENCE BOARD IS INSTALLED
R9 IS REMOVED IF BIPOLAR RATIO BOARD IS INSTALLED
2 PARTIAL REF DES SHOWN, PREFIX WITH SUB-ASSY REF DES A7 IE - A7CR14
1. INDICATES TIE POINTS ON P.C. BOARD.
NOTES (UNLESS OTHERWISE SPECIFIED)
ITEM NO PART NUMBER PART NAME MATERIAL — SPECIFICATION CODE IDENT FINISH REF DES ZONE
REQD PER ASSY
DIM IN INCHES TOLERANCES XXX ± .010 XX ± .03 X ± 1/2°
BREAK ALL SHARP CORNERS & EDGES MACH SURFACES
SIZE D
TITLE SCHEMATIC POWER SUPPLY
MODEL DSM 44
RELEASE
CHECKER
DESIGN
DRFTSMN J. CAMPBELL 9/1/76
PURCHASING
PROJ ENGR
CHF ENGR
CALIFORNIA INSTRUMENTS CORP SAN DIEGO, CALIFORNIA
CONTRACT NO
CODE IDENT 16067
DWG NO D8544-078 REV B
SCALE
SHEET 1 OF 1
DASH NO QTY REQD NEXT ASSEMBLY EFF ON AUTH
D8544-078 B

REVISIONS						
REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE	APRD



-1 P.C. BOARD ASSY

VIEW - COMPONENT SIDE
(SHIELDS NOT SHOWN)
CLAD SHOWN IS FAR SIDE

SIDE VIEW SHOWING SHIELD ASSY

-1 PARTS LIST	SEE SHEETS 4 THRU 7					
ITEM NO. / REQD PER ASSY	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES.	ZONE

3. WIRE J8-1 TO K1-5 AS SHOWN USING ITEM 129. SLEEVE WITH ITEM 130.
2. INSTALL ITEM 118 (SWAGE FAR SIDE) USING USECO TOOL 2010 OR EQUIV.
1. FOR SCHEMATIC DIAGRAM, SEE DWG D8544-071.

DIM IN INCHES TOLERANCES .XXX = .010 .XX = .03 X° = 30'
BREAK ALL SHARP CORNERS & EDGES MACH SURFACES
DWG SIZE C

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TITLE: P.C. BOARD ASSY, A.C. CONVERTER A3

MODEL DSM44-OPTION 01

RELEASE 7/3/75

CHECKER 9/2/75 PURCHASING

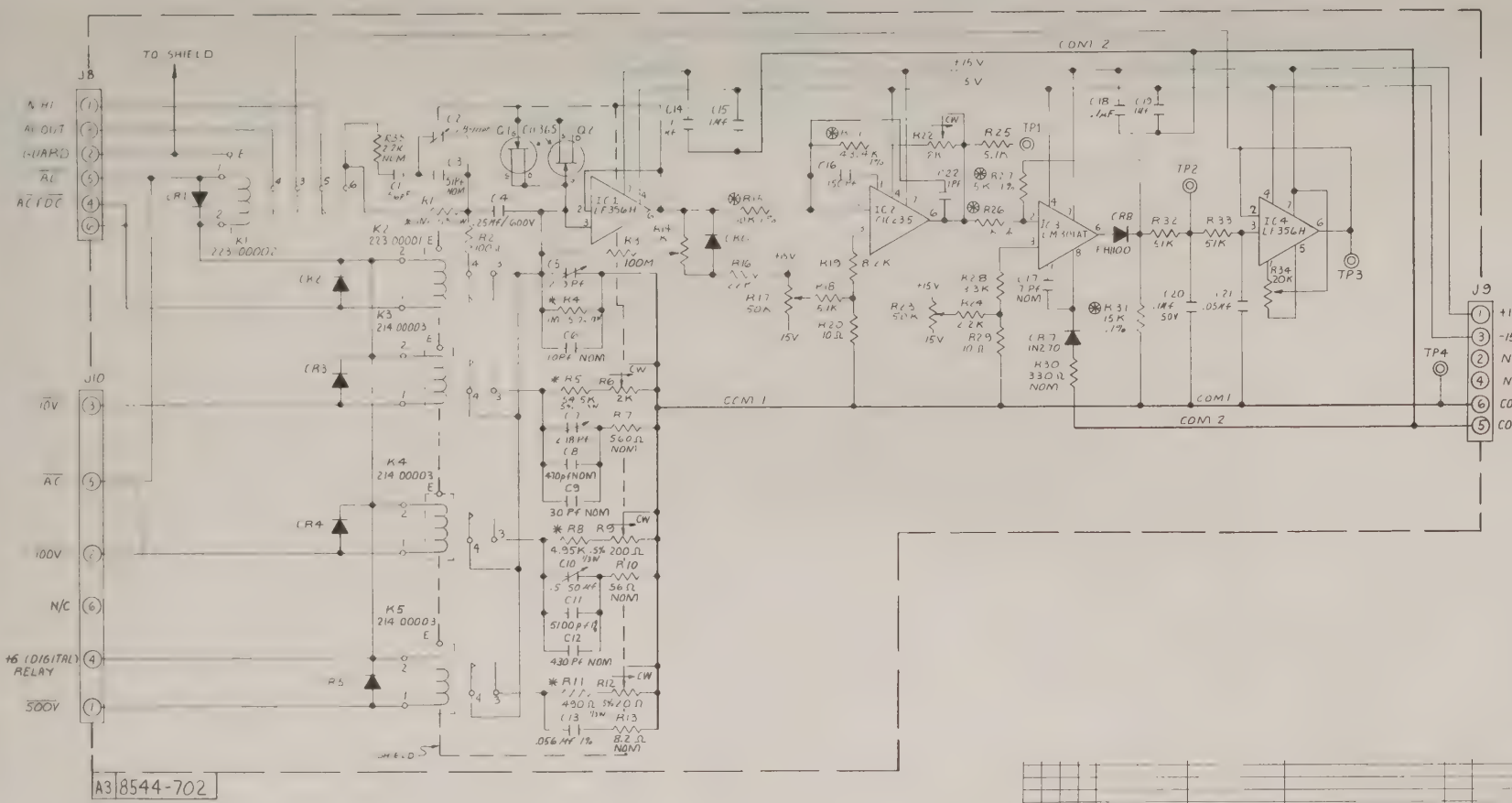
DESIGN 9/4/75 PROJ ENGR

CALIFORNIA INSTRUMENTS a division of AIKEN INDUSTRIES INC.

CONTRACT NO. | CODE IDENT 16067

DWG NO. C8544-702 | REV A

C8544-702 A



REVISIONS						
REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE	APRD
A	EO	INCORP ECO # 1649 JB.			9/16/69	

ITEM NO	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES	ZONE

REQD PER ASSY

- ▲ PARTIAL REF DES ARE SHOWN FOR COMPLETE DES, PREFIX WITH 'A3' (ie A3R4).
- 2 FOR BOARD ASSY SEE DWG C 8544-702.
- 4 RESISTORS ARE IN OHMS 1/4W ±5%
- 3 ⊛ INDICATES MATCHED SET CIC 518
- 2 * INDICATES MATCHED SET CIC 517
- 1 DIODES ARE IN4148.

NOTES (UNLESS OTHERWISE SPECIFIED)

DIM IN INCHES TOLERANCES XXX = .010 XX = .03 X° = 30' | BREAK ALL SHARP CORNERS & EDGES MACH SURFACES ✓ | DWG SIZE D

EXCEPT AS OTHERWISE PROVIDED BY CONTRACT, THE INFORMATION ON THESE DRAWINGS IS THE PROPERTY OF ILOD, AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION

TITLE: SCHEMATIC DIAGRAM AC CONVERTER

MODEL: DSM 44

CONTRACT NO | CODE IDENT: 16067

RELEASE

CHECKER | PURCHASING

DESIGN | PROJ ENGR

DRFTSMN: G R B | CHF ENGR

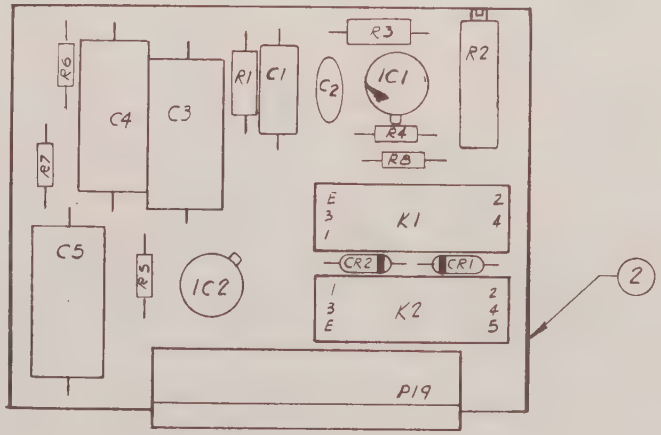
DWG NO: D8544-071 | REV: A

SCALE — | SHEET 1 OF 1

DASH NO | QTY REQD | NEXT ASSEMBLY | EFF ON | AUTH

D8544-071 A

REVISIONS						
REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE	APRD





-1 P.C. BOARD ASSY

VIEW-COMPONENT SIDE
(CLAD SHOWN IS FAR SIDE)

ITEM NO.	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES.	ZONE
REQD PER ASSY							
	-1	P.C. BD ASSY	FOR PL, SEE SHEET 4				

DIM IN INCHES
TOLERANCES
.XXX = .010
.XX = .03
X° = 30'

BREAK ALL SHARP CORNERS & EDGES
MACH SURFACES ✓

DWG SIZE C

TITLE: P.C. BOARD ASSY, A.C. REFERENCE A9

CALIFORNIA INSTRUMENTS a division of AIKEN INDUSTRIES, INC.

MODEL DSM 44

CONTRACT NO. —

CODE IDENT 16067

RELEASE

CHECKER

DESIGN

PURCHASING

PROJ ENGR

DWG NO. C8544-707

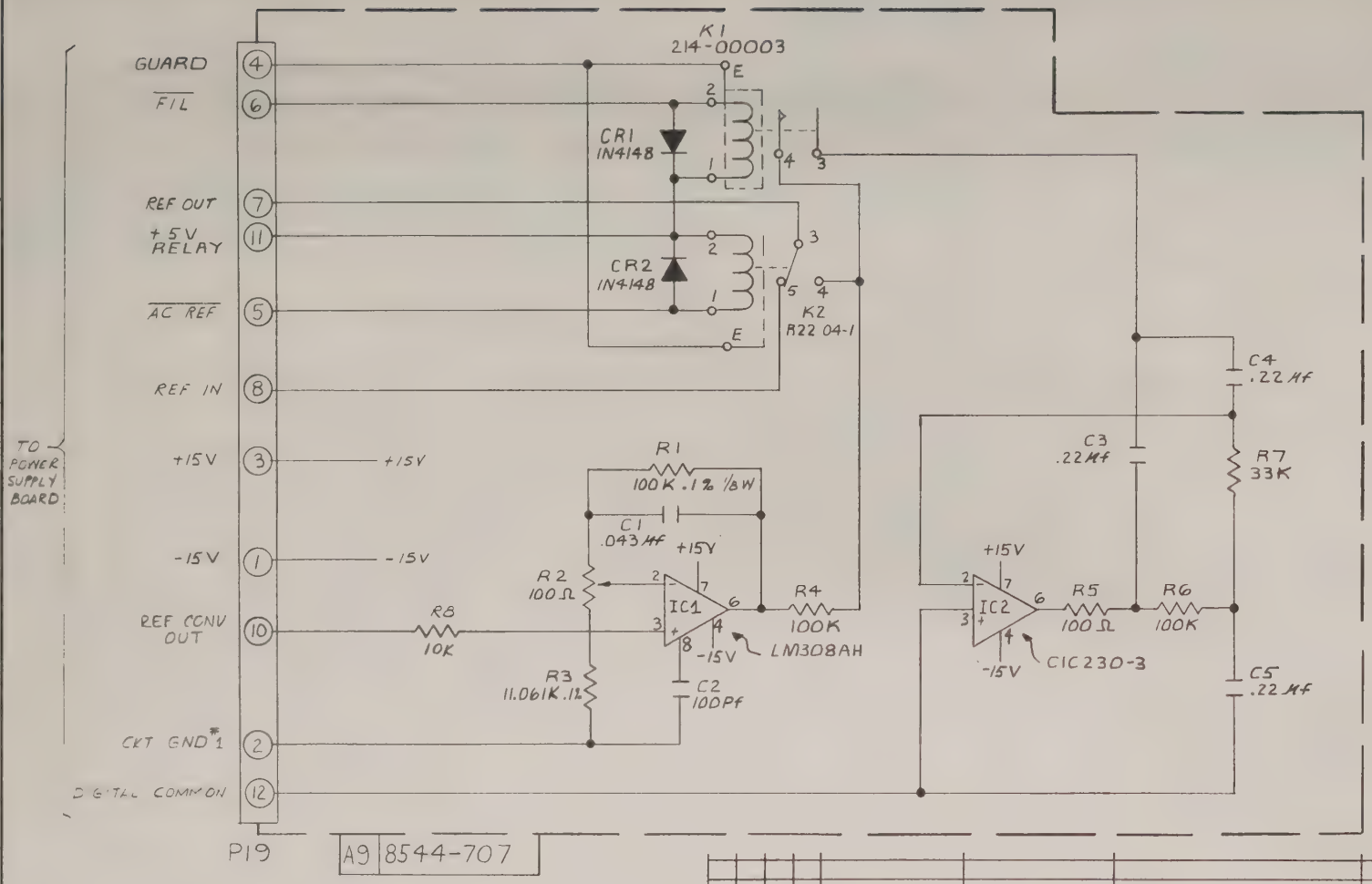
REV —

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1. FOR SCHEMATIC DIAGRAM, SEE DWG C8544-074.

NOTES (UNLESS OTHERWISE SPECIFIED)

C8544-707 -



A9 8544-707

ITEM NO.	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES.	ZONE
REQD PER ASSY							

DIM IN INCHES TOLERANCES .XXX = .010 .XX = .03 X° = 30'

BREAK ALL SHARP CORNERS & EDGES MACH SURFACES ✓

DWG SIZE C

EXCEPT AS OTHERWISE PROVIDED BY CONTRACT, THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALICO AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION.

TITLE: SCHEMATIC DIAGRAM, A.C. REFERENCE

MODEL DSM44

RELEASE			PURCHASING
CHECKER		9/15/78	PROJ ENGR
DESIGN			CHF ENGR
DRFTSMN	G.R.B.	9/15/78	

CALIFORNIA INSTRUMENTS a division of AIKEN INDUSTRIES INC.

CONTRACT NO. | CODE IDENT 16067

DWG NO. C8544-074 | REV -

SCALE — | SHEET 1 OF 1

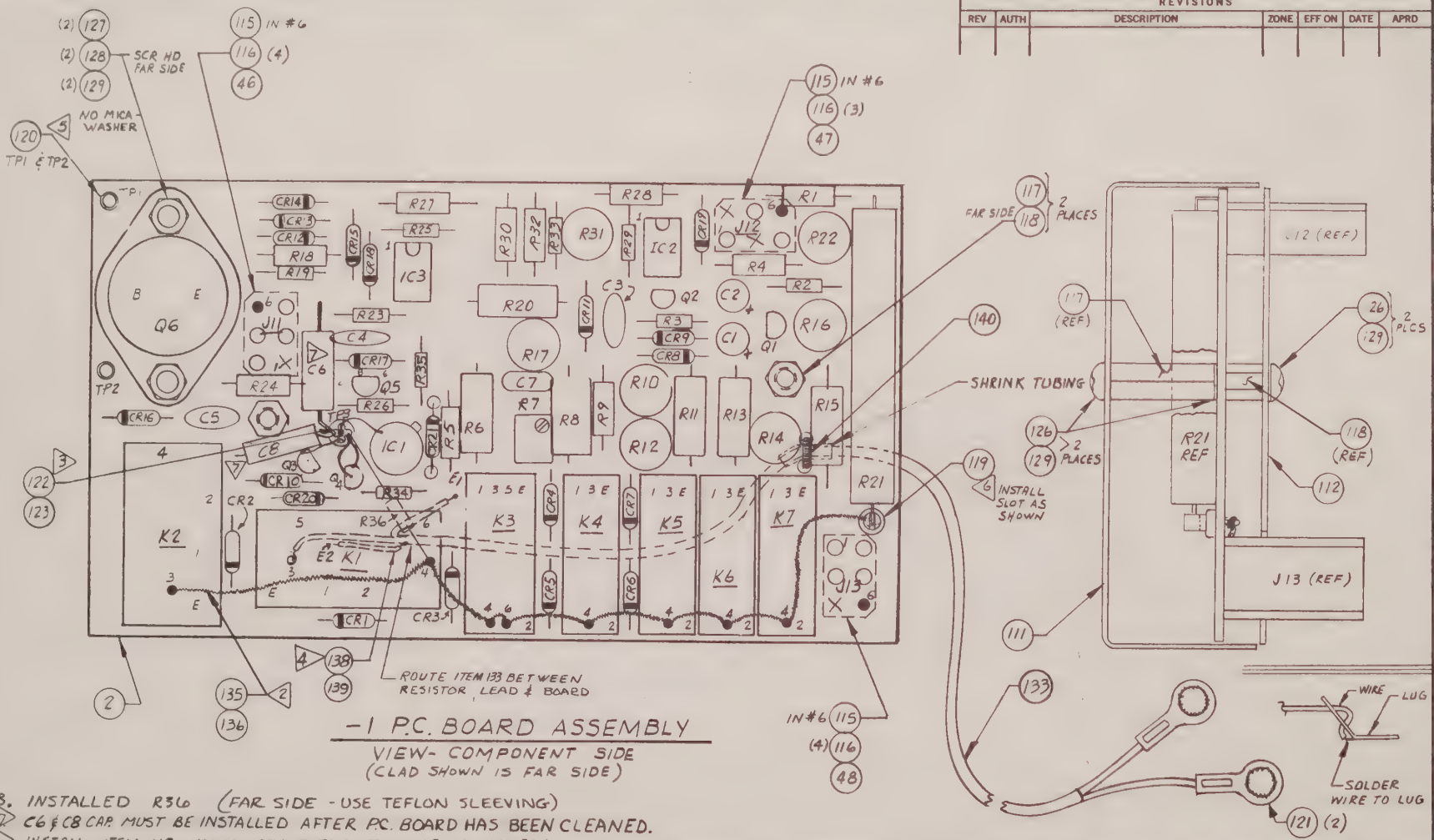
DASH NO.	QTY REQD	NEXT ASSEMBLY	EFF ON	AUTH

CALICO F-102

C8544-074

1. PARTIAL REF. DES. SHOWN, PREFIX WITH A9 ASSY REF. DES. AS IE: A9R3
2. RES STORS ARE IN OHMS 1/4W ± 5%.
FOR BOARD ASSY REF DWG C8544-707

NOTES (UNLESS OTHERWISE SPECIFIED)



-1 P.C. BOARD ASSEMBLY

VIEW- COMPONENT SIDE
(CLAD SHOWN IS FAR SIDE)

8. INSTALLED R36 (FAR SIDE - USE TEFLON SLEEVING)
7. C6 & C8 CAP. MUST BE INSTALLED AFTER P.C. BOARD HAS BEEN CLEANED.
6. INSTALL ITEM 119 USING SEALECTRO TOOL 2P-13 OR EQUIV.
5. SWAGE TP1 & TP2 IN PLACE FROM FAR SIDE USING USECO TOOL 2010 OR EQUIV.
4. PIGTAIL SHIELD (ONE END) AND SOLDER TO A4E2
3. INSTALL ITEM 122 IN BOARD NEAR SIDE USING SEALECTRO TOOL B-9-5 OR EQUIV. INSTALL ITEM 123 CENTER PIN IN CENTER OF ITEM 122. CLIP CENTER PIN OFF .12 OFF BOARD (BOTTOM SIDE ONLY). THE FOLLOWING LEADS ARE SOLDERED IN TP3: IC1-2, C6, Q3-G, Q4-D & Q4-S.
2. POINT TO POINT WIRE FAR SIDE AS SHOWN K2-3 TO K1-4 TO K3-4 TO K3-6 TO K4-4 TO K5-4 TO K6-4 TO K7-4 TO R21-TERMINAL.
1. FOR SCHEMATIC DIAGRAM, SEE DWG D8544-072.

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS

REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE	APRD

-1 PARTS LIST SEE SHEETS 4 THRU 7.

ITEM NO.	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES.	ZONE

REQD PER ASSY

DIM IN INCHES TOLERANCES XXX = .010 XX = .03 X° = 30'
BREAK ALL SHARP CORNERS & EDGES MACH SURFACES
DWG SIZE C

EXCEPT AS OTHERWISE PROVIDED BY CONTRACT, THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALICO AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION.

TITLE: P.C. BOARD ASSY, OHMS CONVERTER A4

MODEL DSM 44 - OPTION 05

RELEASE

CHECKER PURCHASING

DESIGN PROJ ENGR

DRFTSMN ENG ENGR

-1 | 1 | DSM44-OPTION 05

DASH NO. | REV | SHEET | EFF ON | AUTH

CALIFORNIA INSTRUMENTS a division of ALTEX INDUSTRIES, INC.

CONTRACT NO.

CODE IDENT 16067

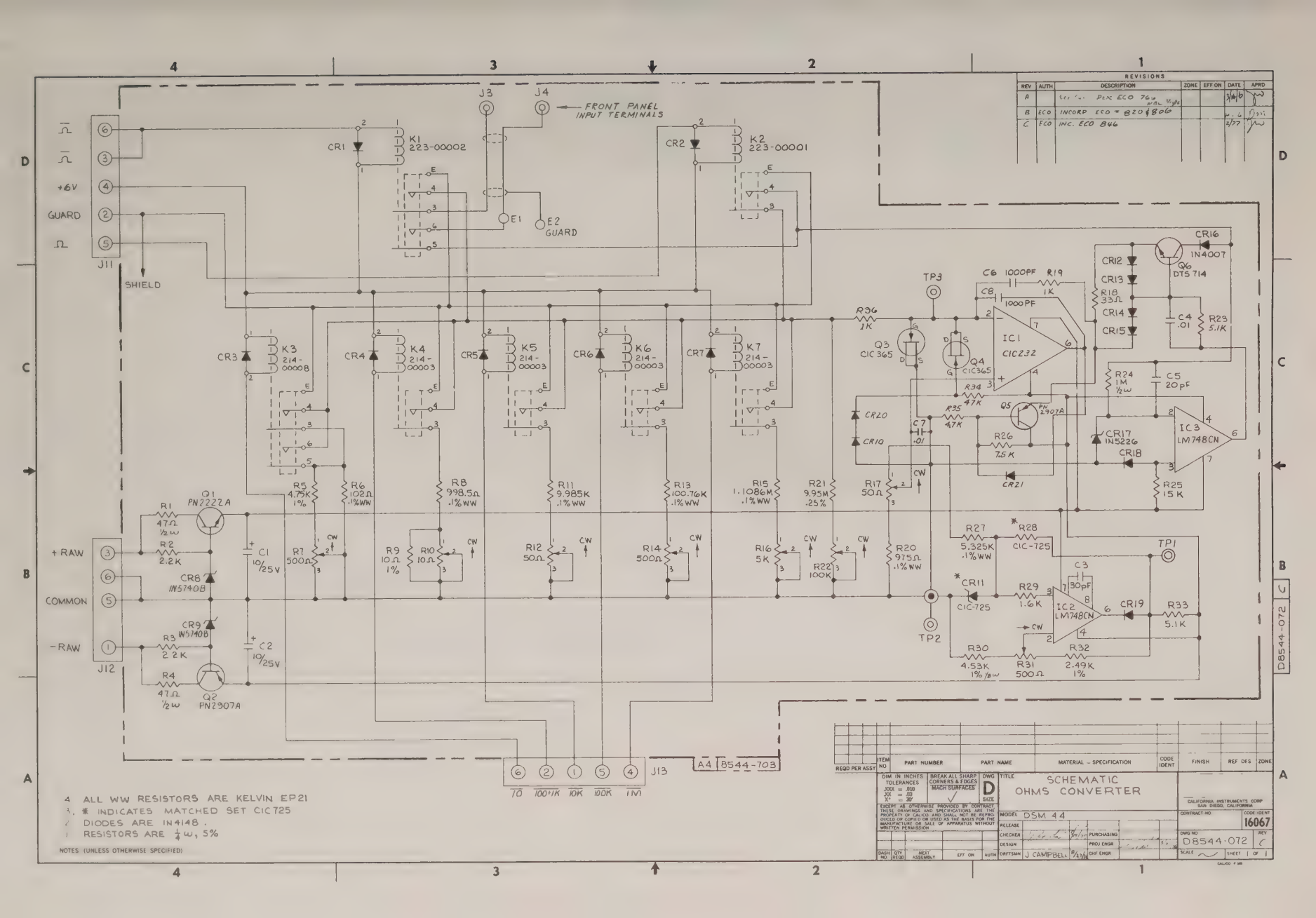
DWG NO. C8544-703

REV C

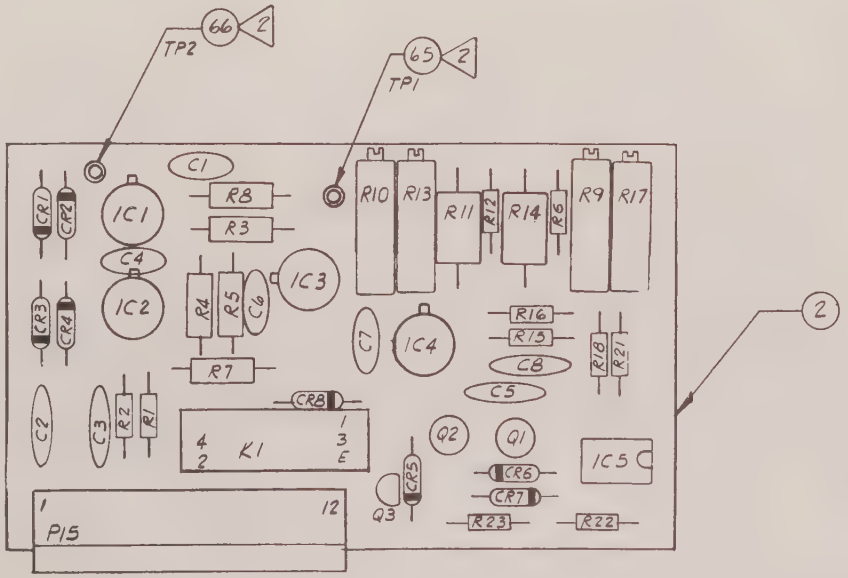
SCALE

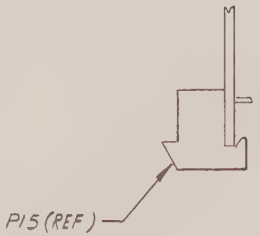
SHEET 3 OF 7

C8544-703 C


REVISIONS
REV. AUTH DESCRIPTION ZONE EFF ON DATE APRD
A ECO INCORP ECO # 820 1806 4/77
B ECO INCORP ECO # 820 1806 4/77
C FCO INC. ECO 846 4/77
FRONT PANEL INPUT TERMINALS
J3
J4
E1
E2 GUARD
J11
SHIELD
+6V
GUARD
CR1
K1 223-00002
CR2
K2 223-00001
CR3
K3 214-00008
CR4
K4 214-00003
CR5
K5 214-00003
CR6
K6 214-00003
CR7
K7 214-00003
IC1 CIC232
IC2 LM748CN
IC3 LM748CN
Q1 PN2222A
Q2 PN2907A
Q3 CIC365
Q4 CIC365
Q5 PN 2907A
Q6 DTS 714
CR16 IN4007
CR17 IN5226
CR8 IN5140B
CR9 IN5140B
CR10
CR11 CIC-725
CR12
CR13
CR14
CR15
CR18
CR19
CR20
CR21
TP1
TP2
TP3
+RAW
COMMON
-RAW
J12
J13
TO 100+1K 10K 100K 1M
R1 47Ω ½w
R2 2.2K
R3 2.2K
R4 47Ω ½w
R5 4.75K 1%
R6 102Ω .1%WW
R7 500Ω
R8 998.5Ω .1%WW
R9 10Ω 1%
R10 10Ω
R11 9.985K .1%WW
R12 50Ω
R13 100.76K .1%WW
R14 500Ω
R15 1.1086M .1%WW
R16 5K
R17 50Ω
R20 975Ω .1%WW
R21 9.95M .25%
R22 100K
R23 5.1K
R24 1M ½w
R25 15K
R26 7.5K
R27 5.325K .1%WW
R28 CIC-725
R29 1.6K
R30 4.53K 1% ½w
R31 500Ω
R32 2.49K 1%
R33 5.1K
R34 47K
R35 47K
R36 1K
C1 10/25V
C2 10/25V
C3 30pF
C4 .01
C5 20pF
C6 1000PF
C7 .01
C8 1000PF
R19 1K
CW
4 ALL WW RESISTORS ARE KELVIN EP21
3. * INDICATES MATCHED SET CIC725
2 DIODES ARE IN4148.
1 RESISTORS ARE ¼ w, 5%
NOTES (UNLESS OTHERWISE SPECIFIED)
A4 8544-703
D8544-072 C
REQD PER ASSY
ITEM NO
PART NUMBER
PART NAME
MATERIAL – SPECIFICATION
CODE IDENT
FINISH
REF DES
ZONE
DIM IN INCHES TOLERANCES .XXX = .010 .XX = .03 X° = 30'
BREAK ALL SHARP CORNERS & EDGES MACH SURFACES
DWG SIZE D
TITLE SCHEMATIC OHMS CONVERTER
MODEL DSM 44
RELEASE
CHECKER
DESIGN
DRFTSMN J CAMPBELL 8/23/76
PURCHASING
PROJ ENGR
CHF ENGR
CALIFORNIA INSTRUMENTS CORP SAN DIEGO, CALIFORNIA
CONTRACT NO
CODE IDENT 16067
DWG NO D8544-072
REV C
SCALE
SHEET 1 OF 1
DASH NO. QTY REQD NEXT ASSEMBLY EFF ON AUTH

REVISIONS						
REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE	APRD





-1 ASSY

VIEW - COMPONENT SIDE
(CLAD SHOWN IS FAR SIDE)

C8544-708 A

ITEM NO.	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES.	ZONE
REQD PER ASSY		-1 P.C. ASSY	SEE PL SHEETS 4 & 5.			A,O	

DIM IN INCHES
TOLERANCES
XXX = .010
XX = .03
X° = 30'

BREAK ALL SHARP CORNERS & EDGES
MACH SURFACES

DWG SIZE C

TITLE: P.C. BOARD ASSY, A10
4-WIRE AUTO / BI-POLAR RATIO

MODEL: DSM 44 - OPTION 06

RELEASE

CHECKER

DESIGN

PURCHASING

ENGINEER

CALIFORNIA INSTRUMENTS
a division of AIKEN INDUSTRIES INC.

CONTRACT NO.

CODE IDENT 16067

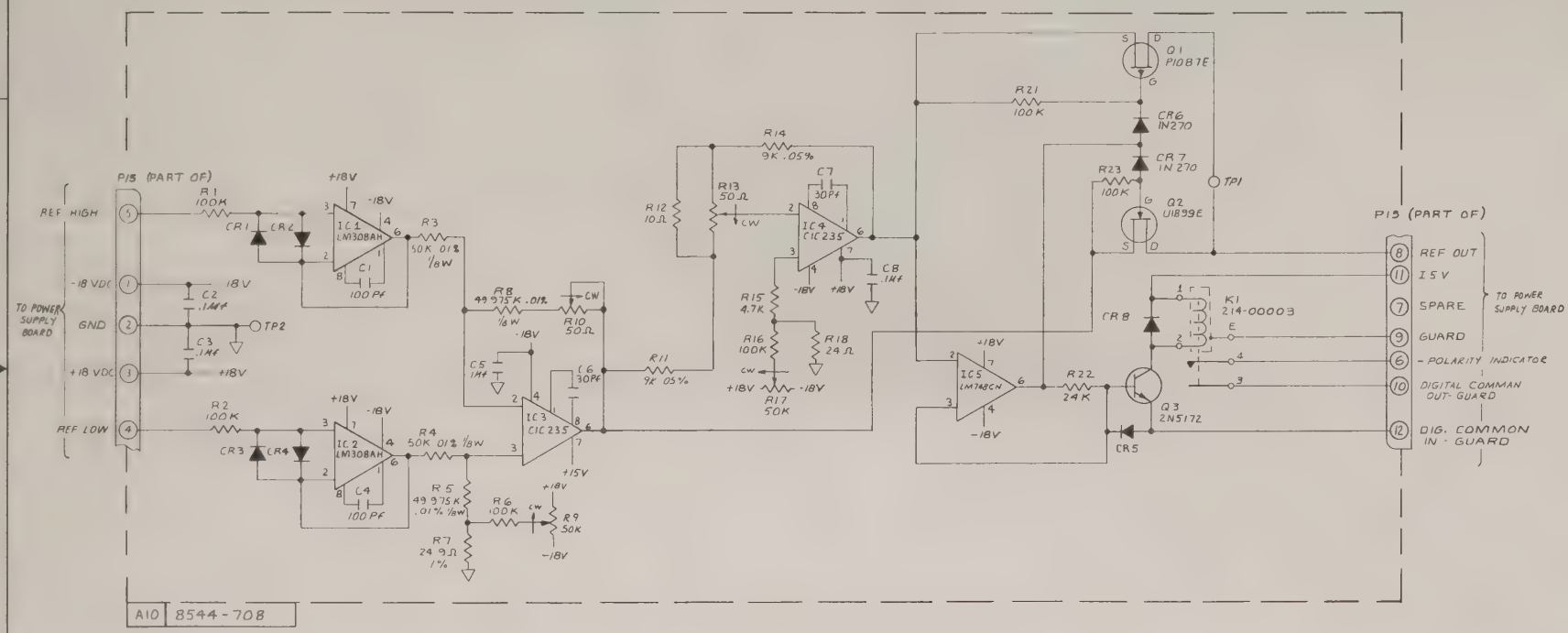
DWG NO. C-5544-708

REV 2

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INSTALL TERMINALS (SWAGE FAR SIDE) USING USECO 2010 TOOL OR EQUIV.
FOR SCHEMATIC DIAGRAM, SEE DWG D8544-077.



REVISIONS

REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE	APRD
A	ECO	INC ECO #820				
B	ECO	INC ECO #820				

NOTES (UNLESS OTHERWISE SPECIFIED)

1. DIODES ARE IN4148.
2. ▽ INDICATES CIRCUIT GROUND.
3. RESISTORS ARE ¼ W 5% VALUE IN OHMS, R19 & R20 NOT USED
4. PARTIAL REF DES ARE SHOWN. FOR COMPLETE REF DES. PREFIX WITH "A10".
5. FOR ASSY DWG SEE C8544-708

ITEM NO	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES	ZONE

REQD PER ASSY

DIM IN INCHES TOLERANCES XXX ± .010 XX ± .03 X° ± 30

BREAK ALL SHARP CORNERS & EDGES MACH SURFACES ✓

DWG SIZE D

EXCEPT AS OTHERWISE PROVIDED BY CONTRACT, THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALICO, AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION

TITLE SCHEMATIC DIAGRAM 4-WIRE AUTO/BI-POLAR RATIO ASSY

MODEL DSM 44

RELEASE

CHECKER — PURCHASING

DESIGN — PROJ ENGR

DRFTSMAN G.A.B. 4/24/75 CHF ENGR

DASH NO | QTY REQD | NEXT ASSEMBLY | EFF ON | AUTH

CALIFORNIA INSTRUMENTS CORP. SAN DIEGO, CALIFORNIA

CONTRACT NO | CODE IDENT NO 16067

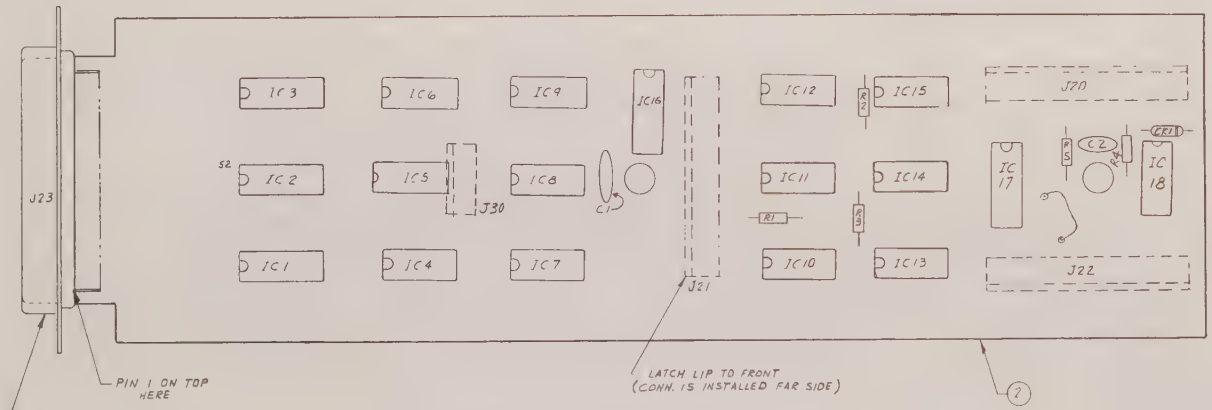
DWG NO D8544-077 | REV B

SCALE — | SHEET 1 OF 1

CALICO F-68

D8544-077 B

REVISIONS					
REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE	APRO





-1 P.C BOARD ASSY

VIEW- COMPONENT SIDE
(CLAD SHOWN FAR SIDE)

D8544-709 B

ITEM NO	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES	ZONES
REQD PER ASSY							
-1		PARTS LIST	SEE SHEETS 4 & 5				

DIM IN INCHES TOLERANCES XXX — .010 XX — .03 X° — 30'
BREAK ALL SHARP CORNERS & EDGES MACH SURFACES
DWG SIZE D

EXCEPT AS OTHERWISE PROVIDED BY CONTRACT, THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CAL-CO AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION

TITLE: PRINT BOARD ASSEMBLY A11

MODEL: DSM44-OPTION 07

CALIFORNIA INSTRUMENTS CORP SAN DIEGO, CALIFORNIA

CONTRACT NO | CODE IDENT 16067

DWG NO D8544-709 B | REV

SCALE 2X | SHEET 2 OF 5

RELEASE | CHECKER | DESIGN | DRFTSMN | PURCHASING | PROJ ENGR | CHF ENGR

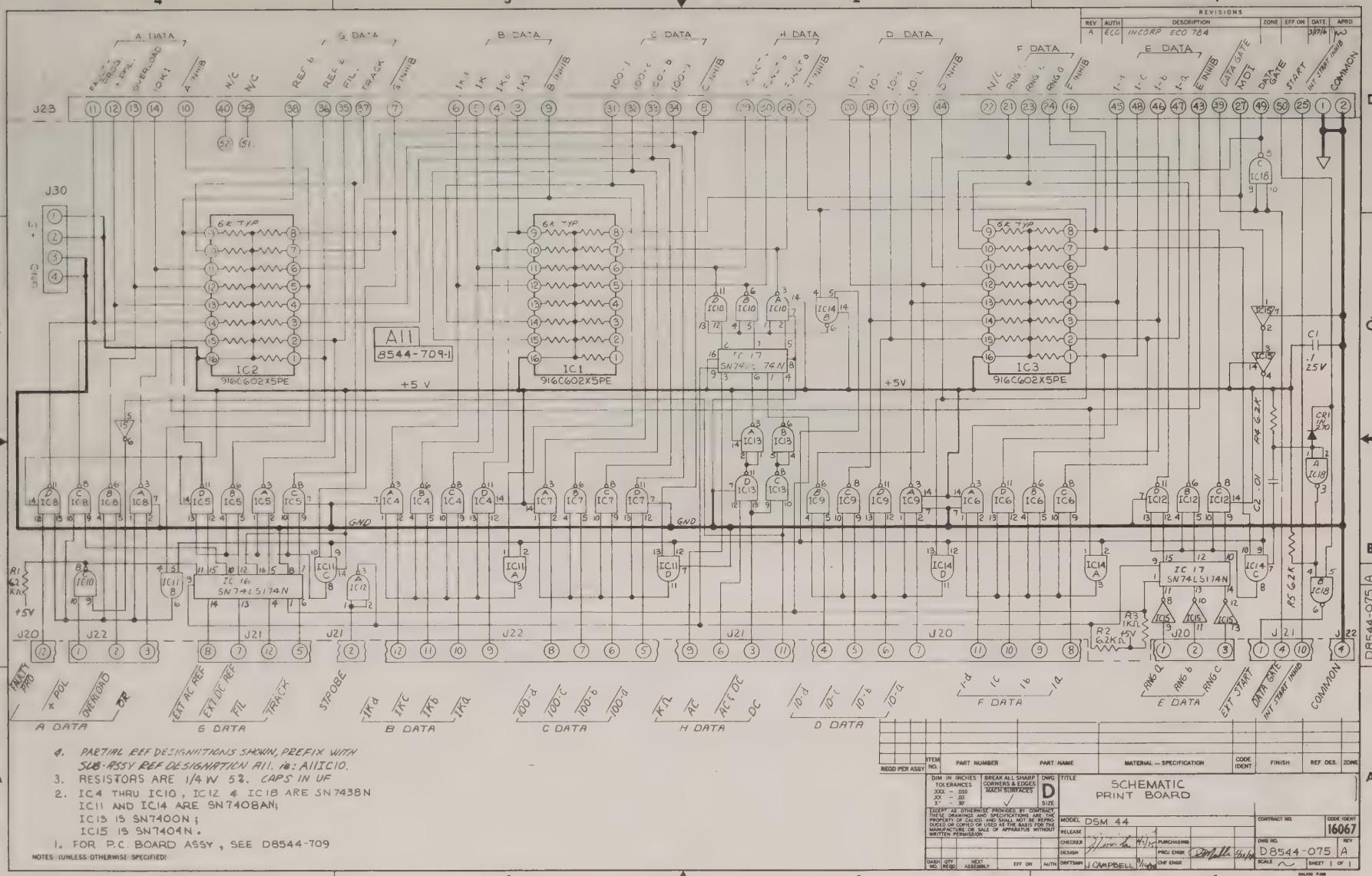
DASH NO (REQD) | QTY NEXT ASSEMBLY | EFF ON | AUTH

CALICO F-180

<2> SHIP ITEM 36 (P23) BAGGED AND TAGGED WITH UNIT. THIS PLUG MATES WITH J23.

1. FOR SCHEMATIC DIAGRAM, SEE DWG D8544-075.

NOTES (UNLESS OTHERWISE SPECIFIED)



4. PARTIAL REF DESIGNATIONS SHOWN, PREFIX WITH SUB-ASSY REF DESIGNATION A11. ie: A11IC10.
3. RESISTORS ARE 1/4 W 5%. CAPS IN UF
2. IC4 THRU IC10, IC12 & IC18 ARE SN7438N
   IC11 AND IC14 ARE SN7408AN;
   IC13 IS SN7400N;
   IC15 IS SN7404N.
1. FOR P.C. BOARD ASSY, SEE D8544-709

NOTES: (UNLESS OTHERWISE SPECIFIED)

REVISIONS					
REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE / APRD
A	ECO	INCORP ECO 784			3/7/76

ITEM NO.	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES.	ZONE

REQD PER ASSY

DIM IN INCHES TOLERANCES .XXX – .010 .XX – .03 X° – 30'
BREAK ALL SHARP CORNERS & EDGES MATCH SURFACES
DWG SIZE D

EXCEPT AS OTHERWISE PROVIDED BY CONTRACT THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF DIGITAL SYSTEMS. THEY ARE LOANED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION

TITLE: SCHEMATIC PRINT BOARD

MODEL: DSM 44

RELEASE			
CHECKER		PURCHASING	
DESIGN		PROJ ENGR	
DRAFTSMN	J CAMPBELL	CHF ENGR	

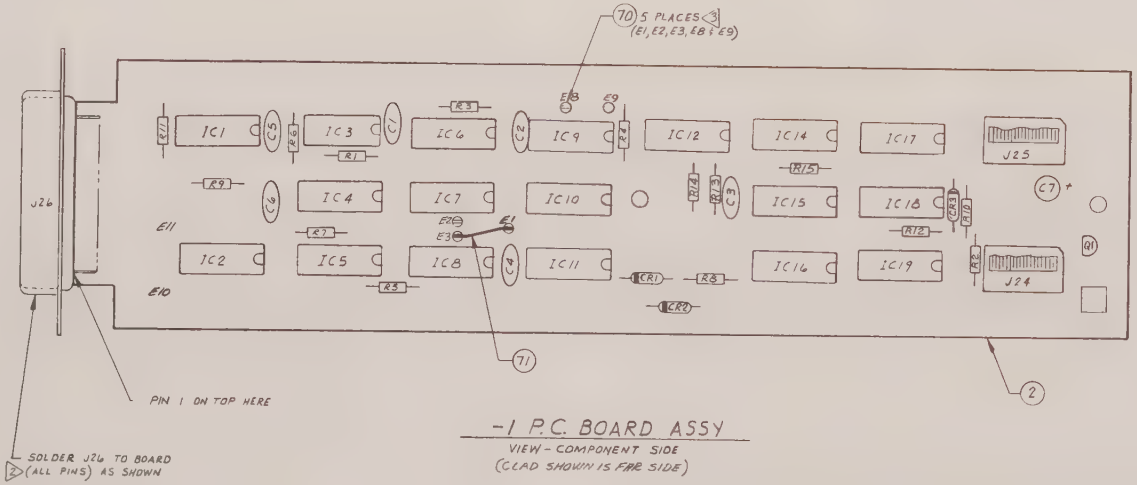
CONTRACT NO. | CODE IDENT 16067

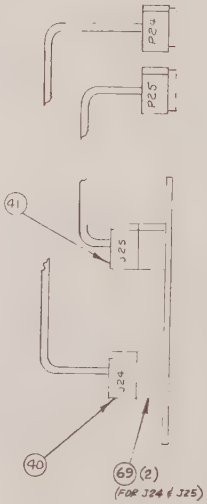
DWG NO. D8544-075 | REV A

SCALE ~ | SHEET 1 OF 1

DASH NO.	QTY REQD	NEXT ASSEMBLY	EFF ON	AUTH

D8544-075 A





-1 P.C. BOARD ASSY

VIEW - COMPONENT SIDE
(CLAD SHOWN IS FAR SIDE)

REVISIONS						
REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE	APRD

3 INSTALL ITEM 70 TERMINALS (SWAGE FAR SIDE) USING USECO TOOL NO. 2000 OR EQUIV.

3 SHIP ITEM 46, A12P26 BAGGED AND TAGGED WITH UNIT. THIS PLUG MATES WITH A12J26.

1. FOR SCHEMATIC DIAGRAM, SEE DWG E8544-076

NOTES (UNLESS OTHERWISE SPECIFIED)

-1 PARTS LIST SEE SHEET 4 F 5.

REQD PER ASSY	ITEM NO	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES	ZONE

DIM IN INCHES TOLERANCES XXX — 0.0 XX — .03 X° — 30'
BREAK ALL SHARP CORNERS & EDGES MACH SURFACES
DWG SIZE D

EXCEPT AS OTHERWISE PROVIDED BY CONTRACT THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALIF. INST. CORP. AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION

TITLE: P.C. BOARD ASSY, REMOTE CONTROL A12

MODEL DSM44-OPTION 08

RELEASE

CHECKER

DESIGN

DRFTSMN M MARTIN 5-13-75

PURCHASING

PROJ ENGR

CHF ENGR

CALIFORNIA INSTRUMENTS CORP SAN DIEGO, CALIFORNIA

CONTRACT NO

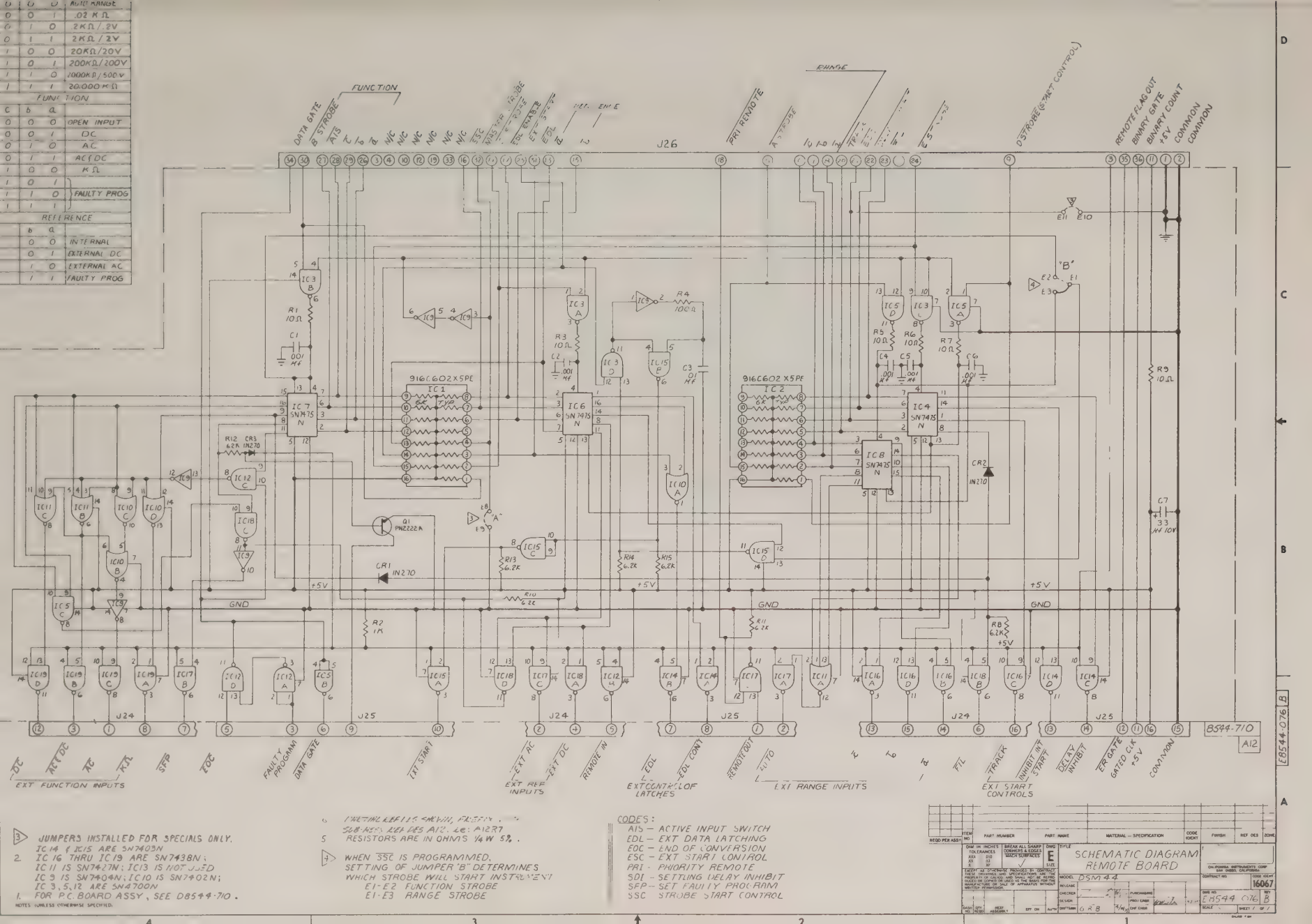
CODE IDENT 16067

DWG NO D8544-710 REV B

SCALE 8X SHEET 2 OF 5

DASH NO	QTY REQD	NEXT ASSEMBLY	EFF ON	AUTH
	1	8099 430		

D8544-710 B



c	b	a	
0	0	0	AUTO RANGE
0	0	1	.02 KΩ
0	1	0	2KΩ / 2V
0	1	1	2KΩ / 2V
1	0	0	20KΩ/20V
1	0	1	200KΩ/200V
1	1	0	2000KΩ/500V
1	1	1	20,000 KΩ

FUNCTION

c	b	a	
0	0	0	OPEN INPUT
0	0	1	DC
0	1	0	AC
0	1	1	AC∫DC
1	0	0	KΩ
1	0	1	
1	1	0	FAULTY PROG
1	1	1	

REFERENCE

	b	a	
	0	0	INTERNAL
	0	1	EXTERNAL DC
	1	0	EXTERNAL AC
	1	1	FAULTY PROG

(3) JUMPERS INSTALLED FOR SPECIALS ONLY.

2. IC 14 F IC'S ARE SN7403N
   IC 16 THRU IC 19 ARE SN7438N;
   IC 11 IS SN7427N; IC 13 IS NOT USED
   IC 9 IS SN7404N; IC 10 IS SN7402N;
   IC 3, 5, 12 ARE SN7400N

1. FOR P.C. BOARD ASSY, SEE D8544-710.

NOTES (UNLESS OTHERWISE SPECIFIED)

6. [illegible] SHOWN, FULLY [illegible]
   SUBASSY ILLUSTRATES A15, i.e.: A12R7
5. RESISTORS ARE IN OHMS 1/4 W 5%.

(4) WHEN SSC IS PROGRAMMED, SETTING OF JUMPER 'B' DETERMINES WHICH STROBE WILL START INSTRUMENT
   E1-E2 FUNCTION STROBE
   E1-E3 RANGE STROBE

CODES:
AIS – ACTIVE INPUT SWITCH
EDL – EXT DATA LATCHING
EOC – END OF CONVERSION
ESC – EXT START CONTROL
PRI – PRIORITY REMOTE
SDI – SETTLING DELAY INHIBIT
SFP – SET FAULTY PROGRAM
SSC STROBE START CONTROL

ITEM NO	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES	ZONE
REQD PER ASSY							

DIM IN INCHES TOLERANCES XXX .010 XX .03 X .1 — BREAK ALL SHARP CORNERS & EDGES MATCH SCRIBE FACES

SIZE E

TITLE: SCHEMATIC DIAGRAM REMOTE BOARD

MODEL: DSM44

CONTRACT NO.

CODE IDENT 16067

DWG NO. E8544 076 REV B

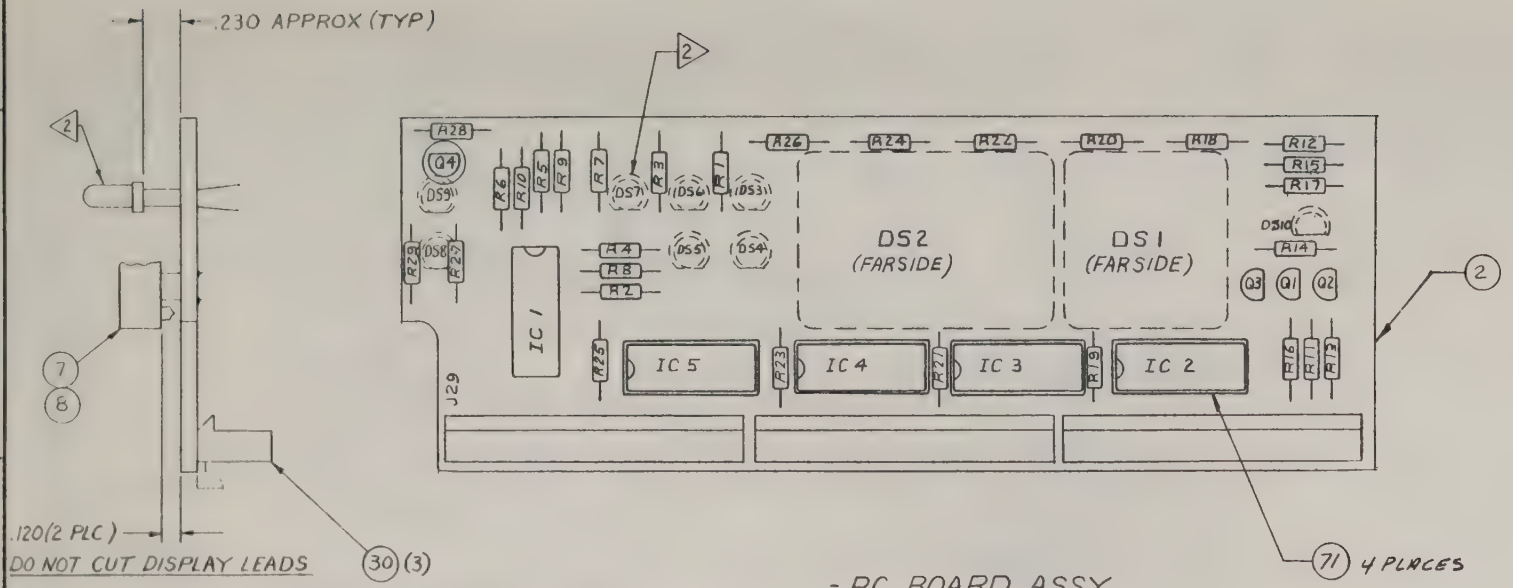
SCALE — SHEET 1 OF 1

CALIFORNIA INSTRUMENTS CORP SAN DIEGO, CALIFORNIA

DRAWN — DATE — CHECKED — RELEASED — ENG ON — AUTH — DRAFTSMAN GRB 3/4/69

PURCHASING — PROJ ENGR — CHF ENGR

EXCEPT AS OTHERWISE PROVIDED IN CONTRACT OR ORDER, INFORMATION ON THIS DRAWING IS PROPRIETARY OF CALIFORNIA AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION.



- PC BOARD ASSY

COMPONENT SIDE
(CLAD SHOWN IS FAR SIDE)

REQD PER ASSY	ITEM NO.	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES.	ZONE
-/		PL8544-701	PARTS LIST	SH 4 AND SH 5				

DIM IN INCHES TOLERANCES .XXX = .010 .XX = .03 X° = 30'
BREAK ALL SHARP CORNERS & EDGES MACH SURFACES
DWG SIZE C

EXCEPT AS OTHERWISE PROVIDED BY CONTRACT, THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALICO AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION.

TITLE: PC BOARD ASSEMBLY DISPLAY A2

MODEL DSM44

RELEASE		7-2-75	
CHECKER		7-31-75	PURCHASING
DESIGN			PROJ ENGR
DRFTSMN	G.R.B	4/1/75	CHF ENGR

CALIFORNIA INSTRUMENTS a division of AIRON INDUSTRIES INC

CONTRACT NO.

CODE IDENT 16067

DWG NO. C8544-701 REV D

SCALE 2/1 SHEET 2 OF 5

DASH NO.	QTY REQD	NEXT ASSEMBLY	EFF ON	AUTH
1	1	8544-900		

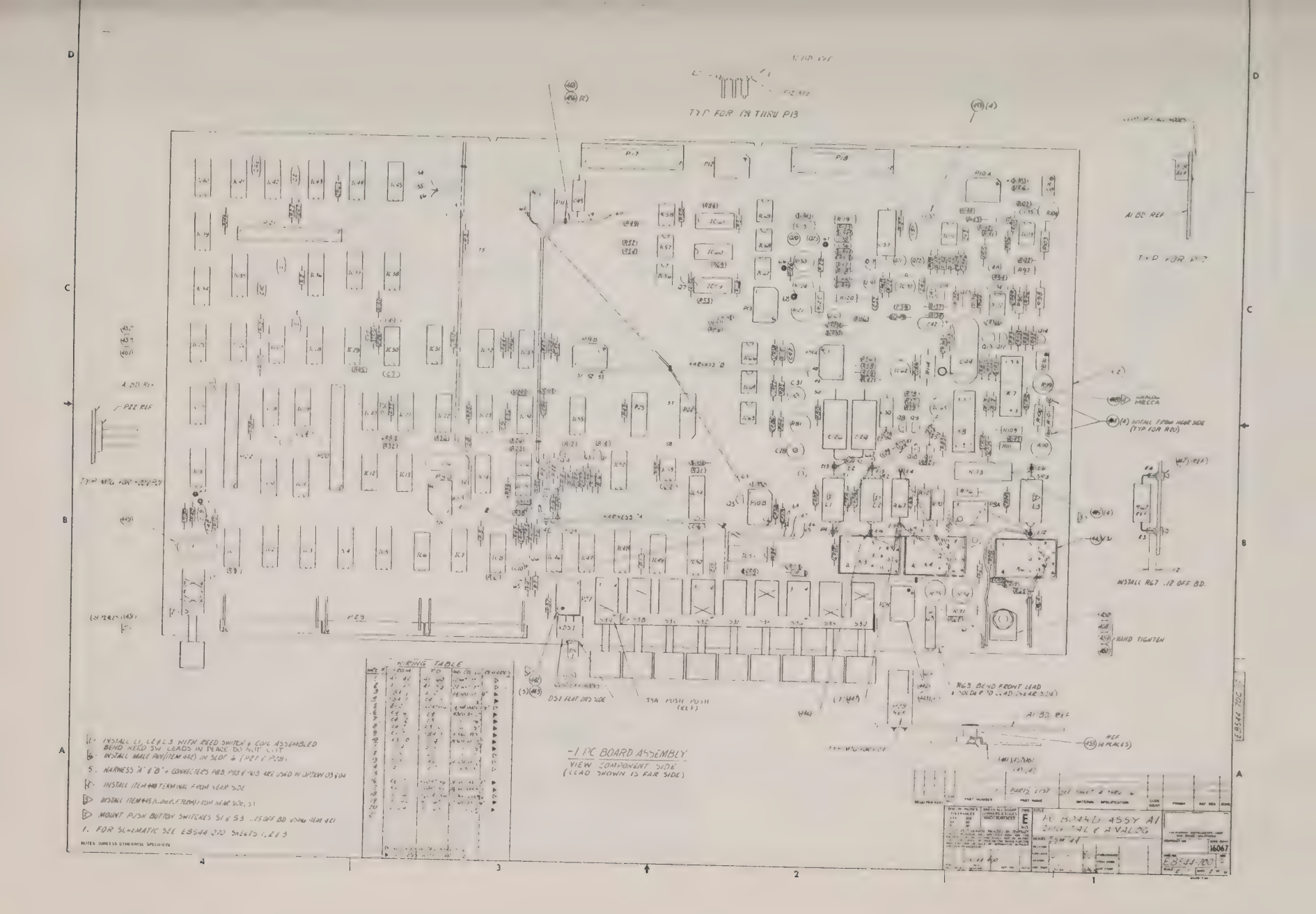
2> INSTALL WITH FLAT IN BASE AS SHOWN IN TOP VIEW, LEAVE LEADS LONG & DO NOT SOLDER (SPREAD LEADS SLIGHTLY TO KEEP INDICATORS IN PLACE). TYP DS3 THRU DS10.

1. FOR SCHEMATIC SEE 8544-070.

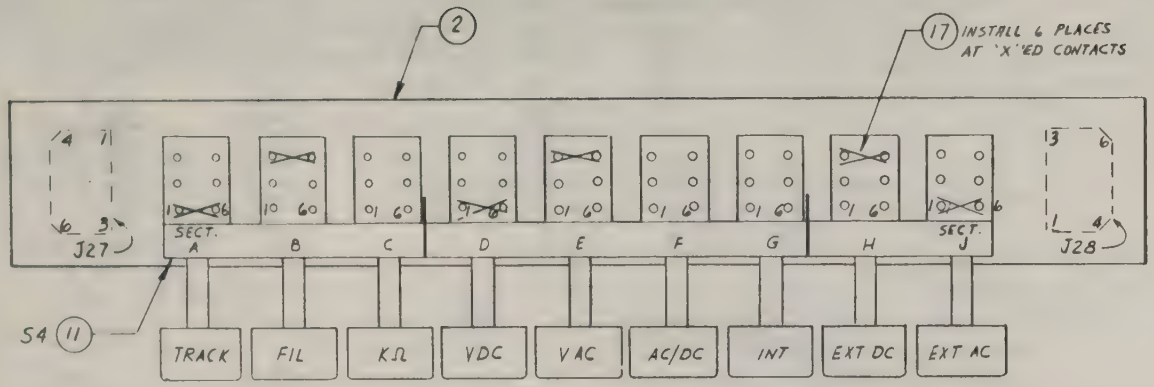
NOTES: (UNLESS OTHERWISE SPECIFIED)

C8544-701 D

CO F-102

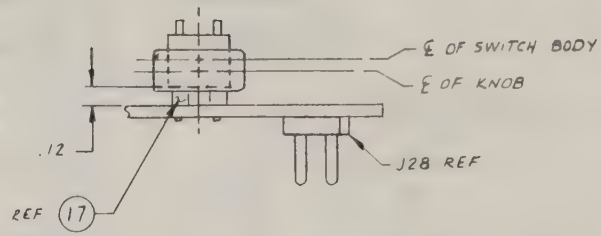

TYP FOR P1A THRU P1B
P1A
P1B
A1 BD REF
TYP FOR K7
INSTALL R67 .12 OFF BD.
HAND TIGHTEN
R63 BEND FRONT LEAD & SOLDER TO LEAD (NEAR SIDE)
A1 BD REF
WIRING TABLE
FROM
TO
-1 PC BOARD ASSEMBLY
VIEW COMPONENT SIDE
(LEAD SHOWN IS FAR SIDE)
PARTS LIST
EB544 ASSY A1
EB544-100
16067

REV	AUTH	DESCRIPTION	ZONE	EFF ON	DATE	APPD



-1 P.C. BOARD ASSY

S4 FUNCTIONS AND SECTIONS SHOWN FOR REF ONLY.



REQD PER ASSY	ITEM NO	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES.	ZONE
		-1	PARTS LIST	SEE SHEET 4				

DIM IN INCHES
TOLERANCES
XXX = .010
XX = .03
X° = 30'

BREAK ALL SHARP CORNERS & EDGES
MACH SURFACES ✓

DWG SIZE C

TITLE: P.C. BOARD ASSY, SWITCH A8

EXCEPT AS OTHERWISE PROVIDED BY CONTRACT, THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF CALICO AND SHALL NOT BE REPRODUCED OR COPIED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION.

MODEL DSM44

RELEASE			
CHECKER		5/5/75	PURCHASING
DESIGN			PROJ ENGR
DRFTSMN	M MARTIN	5-15-75	CHF ENGR

DASH NO.	QTY REQD	NEXT ASSEMBLY	EFF ON	AUTH
-1	1	B544-900		

CALIFORNIA INSTRUMENTS
A DIVISION OF AIRBORNE INSTRUMENTS LAB

CONTRACT NO
CODE IDENT 16067

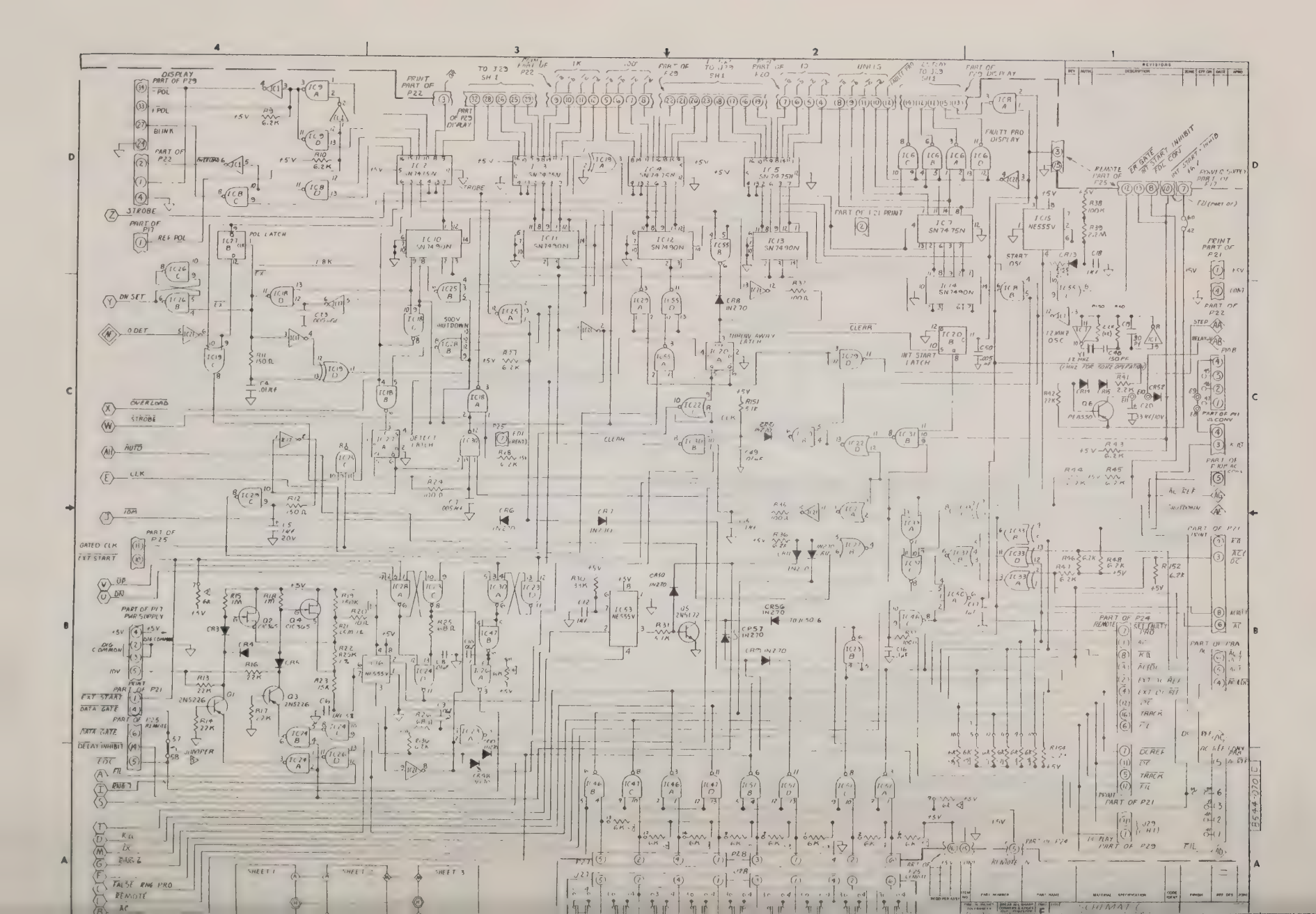
DWG NO C3544-706 REV —

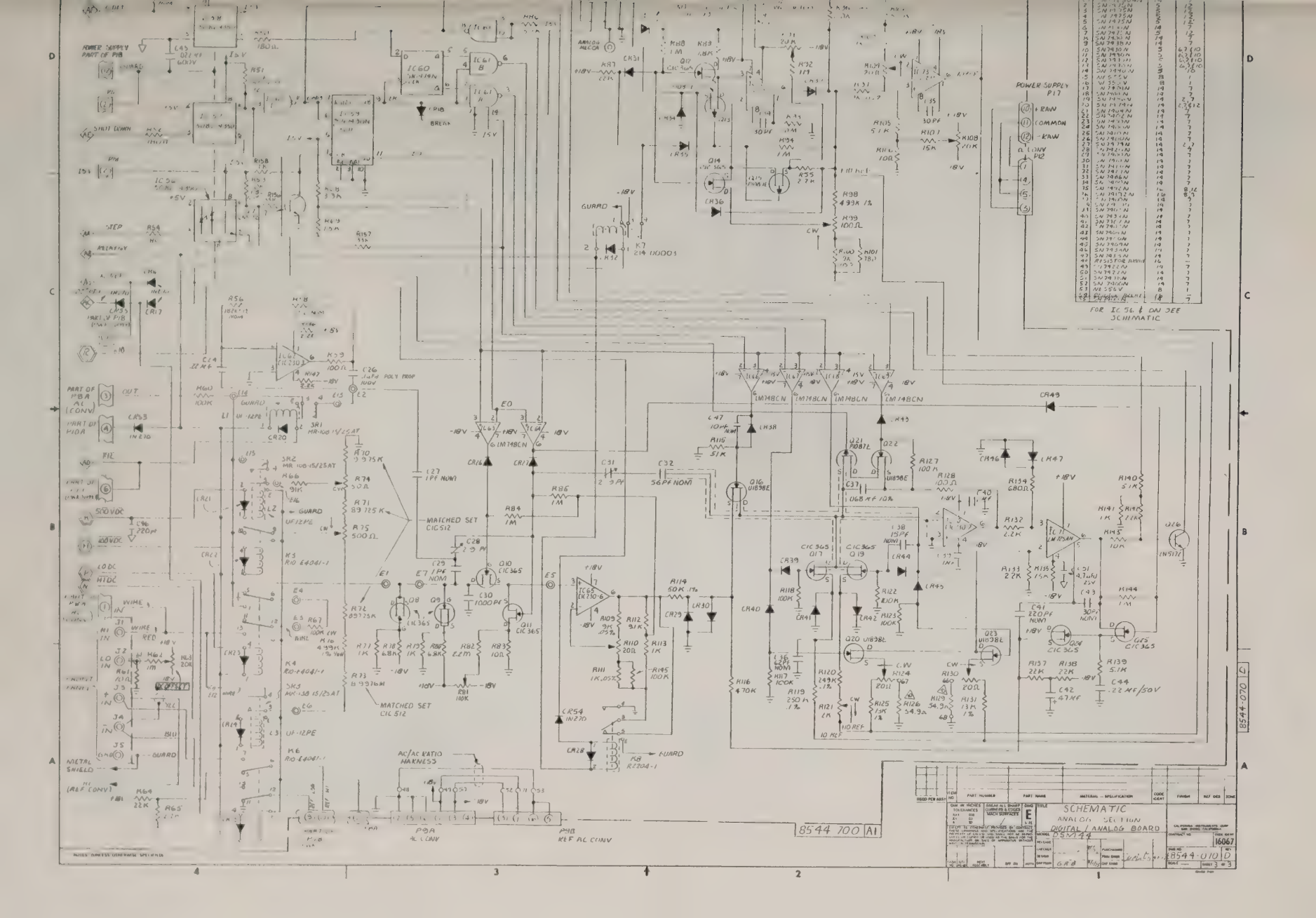
SCALE 2X SHEET 2 OF 3

C3544-706 —

SEE SCHEMATIC DIAGRAM, SEE DWG E3544-070

NOTES: (UNLESS OTHERWISE SPECIFIED)




SCHEMATIC
ANALOG SECTION
DIGITAL / ANALOG BOARD
8544-010 D
8544 700 A1
8544-070 C
POWER SUPPLY PART OF P1B
POWER SUPPLY P17
FOR IC 56 & DAY SEE SCHMATIC
MATCHED SET CIC512
MATCHED SET CIC 512
AC/AC RATIO HARNESS
P9A AC CONV
P9B REF AC CONV
GUARD
METAL SHIELD
LM748CN
CIC365
U1838E
U1838L
IN270
IN4148
IN5711

WIRE TAB TABLE (STD UNIT)					
WIRE NO.	FROM	TO	SIZE	COLOR & INSULATION	REMARKS
1	P1 BLK	XF1-1	24	BLK	POWER CORD
2	P1 WHT	A7-25		WHT	
3	P1 GRN	EB		GRN	
4	A7-24	XF1-2	24	BLK	
5	EB	A1E12	24	GRN	
6	J1	A1E12	24	WHT TEFLON	TYPE EE (1.000 V)
7	J2	A1-61	24	WHT TEFLON	TYPE EE (300 V)
8	J3	A1K6-7	24	WHT TEFLON	TYPE EE SEE C
9	J4	A1K6-10	24	WHT TEFLON	TYPE EE (1000 V)
10	J3	A4K1 3	EXISTING LEAD		
11	J4	A4-E1	ON OHMS CONV. ASSY A9		
12	A7-27 → A1J1 3 A7-28 → A1J1-2 A7-26				2 COND SHIELDED WIRE & 24 BLK
13	A7-29	A1 37	24	RED	
14					
15					
16	J16-G	J2 BLK SHIELD TO J3 GRN		RG 188 A/U & 24 GA BLK *	
17	J16-H	J4 BLU SHIELD TO J5 GRN		RG 188 A/U & 24 GA BLK *	
18	J16-A	J1 RED SHIELD TO J5 GRN		RG 188 A/U & 24 GA BLK *	
19	J16-B	J3 YEL SHIELD TO J5 GRN		RG 188 A/U & 24 GA BLK *	
20	J16-F	A7-22	24	WHT TEFLON	TYPE EE (1000 V)
21					
22					

* PIG TAILS (& SHIELDS) TO BE TERMINATED TO ONE SOLDER LUG

REVISIONS					
REV	AUTH	DESCRIPTION	ZONE	ECP OR	DATE

A9 OHMS CONVERTER OPTION -05
A5 AC REF (PART OF OPTION -03 OR -04)
TOP COVER (49) (69)(2)
(10) A7 POWER SUPPLY
(64)(4)
(5) 10 R ¼W CARBON
A10 BIPOLAR DC/DC RATIO OPTION -06
(35)
(5) 33 K ¼W CARBON
A3 AC CONVERTER OPTION -01
A3 RMS AC CONVERTER OPTION -02
(33)
ITEM 60 REF
(53) (63)(4)
(46)(2)
A11 PRINT ASSY BD OPTION -07
A3 AC REF CONVERTER OPTION -03
A5 RMS AC REF CONVERTER OPTION -04
A12 REMOTE ASSY BD OPTION -08
ITEM 60 REF
(11) A8 UPPER SWITCH PCB

MOUNTING OF A11 & A12 PCB'S
(50) BOTTOM COVER (69)(2)
(52) (67)(2) (68)(2)
(2)(36) (6)
(4) A1 DIGITAL/ANALOG PCB
(4)(60) (2 PLACES)
(5) A2 DISPLAY PCB
(65) REF

FRONT PANEL (REF)
INDICATOR (REF)
DISPLAY BOARD (REF)
DETAIL A-A
TYP 7 PLCS
.10
A1
3
2
XF-1
DETAIL B-B NO SCALE

(51) (47)
J1 RED (27) (63)
J3 YEL (29) (63) (B)
J2 BLK (28) (63)
J4 BLU (30) (63) (B)
J5 GRN (31) (63)
(47)
(62)
EIMRON SYSTEMS MULTIMETER DSM44

(4)(41) (4)(40) (4)(39) (33)
SWITCH - (PART OF OPTION -03 OR -04)
(63) EB (66) (58) (59)
(42) (24) (3)
(54)
J16
A1E SHOWN IN PLACE
(53) (70)(2) (12)(2)
(55) (70)(2) (72)(2)
(46) (58) (59) FOR YFORMER
(45) HOLE PLUG
(61)
(38) PT
REAR VIEW

1. SEE 8544-407 FOR GPIB OPTION ASSEMBLY.
(8) USE DOUBLE NUT ONE SUPPLIED WITH BINDING POST.
(7) EXISTING WIRES FLOW TO ASSEMBLY.
(6) MOUNT HV DECAL ON INSIDE OF BENCH SIDE PANEL.
(5) RESISTOR MUST BE REMOVED TO INSTALL OPTION. RE-INSTALL RESISTOR IF OPTION IS REMOVED.
(4) INSTALL ITEM #60 (SHRINK TUBING) IN APPROXIMATE LOCATION AS SHOWN IN TOP VIEW.
(3) ADD SHRINK SLEEVING OVER TERMINALS OF XF1 AFTER SOLDERING (SEE DETAIL B-B)
(2) SCRIBE INDICATORS INTO FRONT PANEL FOR DETAIL A-A & SOLDER.
(1) FOR SCHEMATIC SEE DWG 8544-070 & 8544-079

NOTES: (UNLESS OTHERWISE SPECIFIED)

REAR INPUT
J16
E
HI A
LO G
D
REF HI B
C
REF LO H
GUARD F
J1 RED → TO A1P3-1
J2 BLK → TO A1J1-3
TO A1K6-7
TO A1E1
J3 YEL → TO A1K6-10
J4 BLU
J5 GRN → GUARD
TO A7-22
REF SCHEMATIC

ITEM NO	PART NUMBER	PART NAME	MATERIAL — SPECIFICATION	CODE IDENT	FINISH	REF DES	ZONE
REQD PER ASSY							

DIM IN INCHES TOLERANCES .XXX ± .010 .XX ± .03 X° ± 30'
BREAK ALL SHARP CORNERS & EDGES MACH SURFACES
(EXCEPT AS OTHERWISE PROVIDED BY CONTRACT THESE DRAWINGS AND SPECIFICATIONS ARE THE PROPERTY OF EIMRON AND SHALL NOT BE REPRODUCED OR USED AS THE BASIS FOR THE MANUFACTURE OR SALE OF APPARATUS WITHOUT WRITTEN PERMISSION)
DWG SIZE D
TITLE UNIT ASSEMBLY
MODEL DSM44
RELEASE
CHECKED
ISSUED
DRAFTSMAN
PURCHASING
PROJ ENGR
CHF ENGR
CAN OF CORONA INSTRUMENTS CORP SAN DIEGO, CALIFORNIA
CONTRACT NO
CODE IDENT 16067
DWG NO 8544-400
REV C
SCALE 1/4
SHEET 2 OF 3

DASH NO | QTY REQD | NEXT ASSEMBLY | EFF ON | AUTH

SECTION VII

REPLACEABLE PARTS LIST

7-1 GENERAL

7-2 This section of the manual contains ordering information and complete lists of replaceable parts. Parts are listed by major assembly in alphanumerical order of their reference designators. Description, manufacture's code ident number and CALIFORNIA INSTRUMENTS stock numbers are indicated. A list of manufactures and their Federal Supply Codes will be found in Appendix A.

7-3 ORDERING INFORMATION

7-4 That we may process you order promptly, please provide the following information, when applicable.

A) Model number and serial number of the instrument.

B) CALIFORNIA INSTRUMENTS part number of the sub-assembly where component is located.

C) Component reference designator.

D) Component description.

E) Component manufacture's number and code identification.

F) CALIFORNIA INSTRUMENTS stock number.

All replaceable parts orders should be placed with CALIFORNIA INSTRUMENTS COMPANY, a division of AIKEN INDUSTRIES, 5150 Convoy Street, San Diego, California 92111.

CALICO CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA | CODE IDENT 16067 | **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
	8544-400-1	UNIT ASSEMBLY	16067		1
					2
					3
A1	8544-700-1	DIGITAL/ANALOG ASSY	16067		4
A2	8544-701-1	DISPLAY BOARD ASSY	16067		5
A3	8544-702-1	AC CONVERTOR ASSY	16067		6
A4	8544-703-1	OHMS CONVERTOR ASSY	16067		7
A5	8544-704-1	RMS CONVERTOR ASSY	16067		8
A6	NOT USED				9
A7	8544-713-1	POWER SUPPLY ASSY	16067		10
A8	8544-706-1	SWITCH BOARD ASSY	16067		11
A9	8544-707-1	AC REF. ASSY	16067		12
A10	8544-708-1	4-WIRE BI-POLAR	16067		13
A11	8544-709-1	PRINT BOARD ASSY	16067		14
A12	8544-710-1	REMOTE BOARD ASSY	16067		15
					16
	8544-401-1	OPTION 03 PARTS LIST	16067		17
	8544-401-2	OPTION 04 PARTS LIST	16067		18
					19
					20
					21
					22
					23
F1*	AGX-3/4A	FUSE 3/4 AMP. F.B.	71400	2-70068	24
	*FOR 230V INPUT USE P/N AGX-1/2A		71400	2-40362	25
					26
J1	3760-RED	BINDING POST	05276	2-50200	27
J2	3760-BLK	BINDING POST	05276	2-50201	28
J3	3760-YEL	BINDING POST	05276	2-50240	29
J4	3760-BLU	BINDING POST	05276	2-50241	30
J5	3760-GRN	BINDING POST	05276	2-50202	31
J6 THRU	J15 NOT USED				32
J16	MS3102A-20-7P	RECEPTACLE	81349	4-10247	33
P16	MS3106A-20-7S	PLUG	81349	4-10264	34
	KKL-4	CABLE CLIP	06915	2-10538	35
		H.V. DECAL	16067	1-20027	36

MODEL	DSM 44	CALICO P/N 8544-400	ASSY R.D.
TITLE	UNIT ASSEMBLY	SHT 3 OF 4	

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
P1 THRU	P6 NOT USED				37
P7	17237	POWER CORD	70903	2-50203	38
	4-40 X 7/16 LG	SCREW, PAN HEAD	81349		39
	#4	WASHER, STAR	81349		40
	4-40	NUT	81349		41
XF1	345001	FUSE HOLDER	75915	2-40264	42
	MS3057-12B	STRAIN RELIEF	81349	4-10179	43
					44
	652	HOLE PLUG 3/8	83330	2-10468	45
	8544-201-7	RACK MTG. BRACKET	16067	1-10562	46
	8544-204-7	BEZEL	16067	1-10563	47
					48
	8544-205-8	COVER - TOP	16067	1-10565	49
	8544-205-7	COVER - BOTTOM	16067	1-10564	50
	8544-207-7	FRONT PANEL	16067	2-10598	51
	8544-208-7	BAR, P.C. BD SUPPORT	16067	1-10566	52
	8544-203-7	SIDE PANEL	16067	1-10567	53
	8544-217-7	REAR PANEL	16067	1-10568	54
	8544-213-7	BUTCH PLATE	16067	1-10569	55
	RG-188A/U	1 COND SHLD WIRE	81349		56
	TYPE EE 1000V	WIRE 24GA/WHT-TEFLON	81349		57
	#8	WASHER, LOCK INT STAR			58
	#8-32	NUT			59
	1/8 DIA 4" LG	SHRINK TUBING			60
	SR-5L-1	STRAIN RELIEF	28520	2-10480	61
	4115	SHORTING STRAP	05276	2-50159	62
	1416-8	SOLDER LUG	83330	2-50053	63
	C8091-632	NUT CLIP	78553	2-10484	64
	8-32 x 3/4" LG	TYPE F THD CUTTING SCR P.H	45722	2-10481	65
	8-32 x 1/2" LG	SCREW PAN HD			66
	#6	WASHER, LOCK INT STAR			67
	6-32 x 3/8" LG	SCREW PAN HD			68
	6-32 x 1/4" LG	SCREW PAN HD			69
	#3	WASHER, LOCK INT STAR			70
					71
	3-56 x 5/16" LG	SCREW PAN HD			72

MODEL DSM 44 — CALICO P/N 8544-400 — ASSY R.D

TITLE UNIT ASSEMBLY — SHT 4 OF 4

CALICO	CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA	CODE IDENT 16067	PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1	8544-700-1	P.C. BOARD ASSEMBLY	16067		1
	-7	P.C. BOARD MECHANICAL	16067	1-60236	2
					3
		EYELET (SEE SHEET 3)			4
					5
A1C1	CM05F221J03	CAPACITOR 220pF 500V	81349	6-10036	6
A1C2	CM05F221J03	CAPACITOR 220pF 500V	81349	6-10036	7
A1C3	C280AE/A10K	CAPACITOR .01μF 250V	73445	6-10929	8
A1C4	C280AE/A10K	CAPACITOR .01μF 250V	73445	6-10929	9
A1C5	T362A105M020AS	CAPACITOR 1μF 20V	05397	6-10761	10
A1C6	1DP-2-104J	CAPACITOR .1μF 100V 5%	72136	6-11011	11
A1C7	CK-502	CAPACITOR .005μF 50V	71590	6-10078	12
A1C8	C280AE/A10K	CAPACITOR .01μF 250V	73445	6-10929	13
A1C9	C280AE/A10K	CAPACITOR .01μF 250V	73445	6-10929	14
A1C10	C280AE/A10K	CAPACITOR .01μF 250V	73445	6-10929	15
A1C11	NOT USED				16
A1C12	C280AE/A100K	CAPACITOR .1μF 250V	73445	6-10916	17
A1C13	NOT USED	CAPACITOR .			18
A1C14	NOT USED	CAPACITOR .			19
A1C15	C280AE/A100K	CAPACITOR .1μF 250V	73445	6-10916	20
A1C16	C280AE/A100K	CAPACITOR, .1μF 250V	73445	6-10916	21
A1C17	C280AE/A100K	CAPACITOR .1μF 250V	73445	6-10916	22
A1C18	C280AE/A100K	CAPACITOR .1μF 250V	73445	6-10916	23
A1C19	CM05E300JO3	CAPACITOR 30pF 500V	81349		24
A1C20	T362B336M010AS	CAPACITOR 33μF 10V	05397	6-10751	25
A1C21	NOT USED	CAPACITOR			26
A1C22	NOT USED	CAPACITOR			27
A1C23	CK-502	CAPACITOR .005μF 50V	71590	6-10078	28
A1C24	32PL2203K-1	CAPACITOR .22μF 100V	12673	6-11009	29
A1C25	NOT USED	CAPACITOR			30
A1C26	32PL1003K-1	CAPACITOR .1μF 100V	12673	6-11025	31
A1C27	CM05CD010D03	CAPACITOR 1pF 500V	81349	6-10905	32
A1C28	HT10KA/29	VARIABLE CAP. 2-9pF	80031	6-10975	33
A1C29	CM05CD010D03	CAPACITOR 1pF 500V	81349	6-10905	34
A1C30	SX210	CAPACITOR 1000pF 600V	90201	6-10910	35
A1C31	HT10KA/29	VARIABLE CAP. 2-9pF	73445	6-10975	36

MODEL	DSM 44	CALICO P/N 8544-700		ASSY R.D.
TITLE	DIGITAL/ANALOG BOARD ASSEMBLY		SHT 4 OF 16	A1

CALICO CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA | CODE IDENT 16067 | **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1C32	CM05E560D03	CAPACITOR 56pF 500V	81349	6-10017	37
A1C33	NOT USED	CAPACITOR			38
A1C34	CM05ED300J03	CAPACITOR 30pF 500V	81349	6-10263	39
A1C35	CM05ED300J03	CAPACITOR 30pF 500V	81349	6-10263	40
A1C36	CM05E620J03	CAPACITOR 62pF 500V	81349	6-10018	41
A1C37	PA2A683K	CAPACITOR .068μF 50V	27556	6-11010	42
A1C38	CM05D150J03	CAPACITOR 15pF 500V	81349	6-10005	43
A1C39	C280AE/A100K	CAPACITOR .1μF 250V	73445	6-10916	44
A1C40	C280AE/A100K	CAPACITOR .1μF 250V	73445	6-10916	45
A1C41	CM05F221J03	CAPACITOR 220pF 500V	81349	6-10036	46
A1C42	T362C476M015AS	CAPACITOR 47μF 15V	05397	6-10877	47
A1C43	CM05E300J03	CAPACITOR 30pF 500V	81349	6-10263	48
A1C44	C280AE/A220K	CAPACITOR .22μF 250V	73445	6-10881	49
A1C45	BA2G223	CAPACITOR .022μF 600V	12406	6-10947	50
A1C46	CM05F221J03	CAPACITOR 220pF 500V	81349	6-10036	51
A1C47	CM05C100J03	CAPACITOR 10pF 500V	81349	6-10003	52
A1C48	CM05F151J03	CAPACITOR 150pF 500V	81349	6-10030	53
A1C49	C280AE/A10K	CAPACITOR .01μF 250V	73445	6-10929	54
A1C50	CK-502	CAPACITOR .005μF 50V	71590	6-10078	55
A1C51	T362B475M025As	CAPACITOR 4.7μF 25V	05937	6-10802	56
					57
					58
A1CR1	1N270	DIODE	81349	3-10006	59
A1CR2	1N270	DIODE	81349	3-10006	60
A1CR3	1N4148	DIODE	25403	3-10227	61
A1CR4	1N4148	DIODE	25403	3-10227	62
A1CR5	1N4148	DIODE	25403	3-10227	63
A1CR6	1N270	DIODE	81349	3-10006	64
A1CR7	1N270	DIODE	81349	3-10006	65
A1CR8	1N270	DIODE	81349	3-10006	66
A1CR9	1N270	DIODE	81349	3-10006	67
A1CR10	1N270	DIODE	81349	3-10006	68
A1CR11	1N270	DIODE	81349	3-10006	69
A1CR12	1N270	DIODE	81349	3-10006	70
A1CR13	1N4148	DIODE	25403	3-10227	71
A1CR14	1N4148	DIODE	25403	3-10227	72

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REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1CR15	1N4148	DIODE	25403	3-10227	73
A1CR16	1N270	DIODE	81349	3-10006	74
A1CR17	1N270	DIODE	81349	3-10006	75
A1CR18	1N4148	DIODE	25403	3-10227	76
A1CR19	NOT USED				77
A1CR20	1N4148	DIODE	25403	3-10227	78
A1CR21	1N4148	DIODE	25403	3-10227	79
A1CR22	1N4148	DIODE	25403	3-10227	80
A1CR23	1N4148	DIODE	25403	3-10227	81
A1CR24	1N4148	DIODE	25403	3-10227	82
A1CR25	1N4148	DIODE	25403	3-10227	83
A1CR26	1N4148	DIODE	25403	3-10227	84
A1CR27	1N4148	DIODE	25403	3-10227	85
A1CR28	1N4148	DIODE	25403	3-10227	86
A1CR29	1N4148	DIODE	25403	3-10227	87
A1CR30	1N4148	DIODE	25403	3-10227	88
A1CR31	1N4148	DIODE	25403	3-10227	89
A1CR32	1N4148	DIODE	25403	3-10227	90
A1CR33	CIC 709	DIODE, ZENER	16067	3-10225	91
A1CR34	1N4148	DIODE	25403	3-10227	92
A1CR35	1N4148	DIODE	25403	3-10227	93
A1CR36	1N4148	DIODE	25403	3-10227	94
A1CR37	1N4148	DIODE	25403	3-10227	95
A1CR38	1N4148	DIODE	25403	3-10227	96
A1CR39	1N4148	DIODE	25403	3-10227	97
A1CR40	1N4148	DIODE	25403	3-10227	98
A1CR41	1N4148	DIODE	25403	3-10227	99
A1CR42	1N4148	DIODE	25403	3-10227	100
A1CR43	1N4148	DIODE	25403	3-10227	101
A1CR44	1N4148	DIODE	25403	3-10227	102
A1CR45	1N4148	DIODE	25403	3-10227	103
A1CR46	1N4148	DIODE	25403	3-10227	104
A1CR47	1N4148	DIODE	25403	3-10227	105
A1CR48	1N270	DIODE	81349	3-10006	106
A1CR49	1N4148	DIODE	25403	3-10227	107
A1CR50	1N270	DIODE	81349	3-10006	108

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REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1CR51	1N270	DIODE	81349	3-10006	109
A1CR52	1N4148	DIODE	25403	3-10227	110
A1CR53	1N270	DIODE	81349	3-10006	111
A1CR54	1N270	DIODE	81349	3-10006	112
A1CR55	1N270	DIODE	81349	3-10006	113
A1CR56	1N270	DIODE	81349	3-10006	114
A1CR57	1N270	DIODE	81349	3-10006	115
A1DS1	LSL-3L	L.E.D.	0000S	2-50212	116
A1XDS1	09-52-3031	CONNECTOR 3 PIN	27264	4-10246	117
A1IC1	SN74LS04N	INTEGRATED CIRCUIT	81349	3-60095	118
A1IC2	SN7475N	INTEGRATED CIRCUIT	81349	3-60004	119
A1IC3	SN7475N	INTEGRATED CIRCUIT	81349	3-60004	120
A1IC4	SN7475N	INTEGRATED CIRCUIT	81349	3-60004	121
A1IC5	SN7475N	INTEGRATED CIRCUIT	81349	3-60004	122
A1IC6	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	123
A1IC7	SN7475N	INTEGRATED CIRCUIT	81349	3-60004	124
A1IC8	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	125
A1IC9	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	126
A1IC10	SN7490N	INTEGRATED CIRCUIT	81349	3-60005	127
A1IC11	SN7490N	INTEGRATED CIRCUIT	81349	3-60005	128
A1IC12	SN7490N	INTEGRATED CIRCUIT	81349	3-60005	129
A1IC13	SN7490N	INTEGRATED CIRCUIT	81349	3-60005	130
A1IC14	SN7490N	INTEGRATED CIRCUIT	81349	3-60005	131
A1IC15	NE555V	INTEGRATED CIRCUIT	18324	3-60026	132
A1IC16	NE555V	INTEGRATED CIRCUIT	18324	3-60026	133
A1IC17	SN7404N	INTEGRATED CIRCUIT	81349	3-60002	134
A1IC18	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	135
A1IC19	SN7486N	INTEGRATED CIRCUIT	81349	3-60062	136
A1IC20	SN7474N	INTEGRATED CIRCUIT	81349	3-60025	137
A1IC21	SN7404N	INTEGRATED CIRCUIT	81349	3-60002	138
A1IC22	SN7402N	INTEGRATED CIRCUIT	81349	3-60001	139
A1IC23	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	140
A1IC24	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	141
A1IC25	SN7410N	INTEGRATED CIRCUIT	81349	3-60051	142
A1IC26	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	143
A1IC27	SN7474N	INTEGRATED CIRCUIT	81349	3-60025	144

CALICO | CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA | CODE IDENT 16067 | PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1IC28	SN7420N	INTEGRATED CIRCUIT	81349	3-60012	145
A1IC29	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	146
A1IC30	SN7410N	INTEGRATED CIRCUIT	81349	3-60051	147
A1IC31	SN7410N	INTEGRATED CIRCUIT	81349	3-60051	148
A1IC32	SN7427N	INTEGRATED CIRCUIT	81349	3-60089	149
A1IC33	SN7486N	INTEGRATED CIRCUIT	81349	3-60062	150
A1IC34	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	151
A1IC35	SN7442N	INTEGRATED CIRCUIT	81349	3-60013	152
A1IC36	SN74192N	INTEGRATED CIRCUIT	81349	3-60014	153
A1IC37	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	154
A1IC38	SN7420N	INTEGRATED CIRCUIT	81349	3-60012	155
A1IC39	SN7402N	INTEGRATED CIRCUIT	81349	3-60001	156
A1IC40	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	157
A1IC41	SN7402N	INTEGRATED CIRCUIT	81349	3-60001	158
A1IC42	SN7404N	INTEGRATED CIRCUIT	81349	3-60002	159
A1IC43	SN7404N	INTEGRATED CIRCUIT	81349	3-60002	160
A1IC44	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	161
A1IC45	SN7404N	INTEGRATED CIRCUIT	81349	3-60002	162
A1IC46	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	163
A1IC47	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	164
A1IC48	916C602X5PE	RESISTOR ARRAY	56289	3-60075	165
A1IC49	SN7422N	INTEGRATED CIRCUIT	81349	3-60090	166
A1IC50	SN7422N	INTEGRATED CIRCUIT	81349	3-60090	167
A1IC51	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	168
A1IC52	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	169
A1IC53	NE555V	INTEGRATED CIRCUIT	18324	3-60026	170
A1IC54	916C602X5PE	RESISTOR ARRAY	56289	3-60075	171
A1IC55	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	172
A1IC56	5082-4350	INTEGRATED CIRCUIT	28480	3-60073	173
A1IC57	5082-4350	INTEGRATED CIRCUIT	28480	3-60073	174
A1IC58	5082-4350	INTEGRATED CIRCUIT	28480	3-60073	175
A1IC59	SN7490N	INTEGRATED CIRCUIT	81349	3-60005	176
A1IC60	SN7474N	INTEGRATED CIRCUIT	81349	3-60025	177
A1IC61	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	178
A1IC62	CIC 230-3 (ORN)	INTEGRATED CIRCUIT	16067	3-60036	179
A1IC63	LM748CN	INTEGRATED CIRCUIT	27014	3-60086	180

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REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1IC64	LM748CN	INTEGRATED CIRCUIT	27014	3-60086	181
A1IC65	CIC 230-6 (BLU)	INTEGRATED CIRCUIT	16067	3-60039	182
A1IC66	LM748CN	INTEGRATED CIRCUIT	27014	3-60086	183
A1IC67	LM748CN	INTEGRATED CIRCUIT	27014	3-60086	184
A1IC68	LM748CN	INTEGRATED CIRCUIT	27014	3-60086	185
A1IC69	LM748CN	INTEGRATED CIRCUIT	27014	3-60086	186
A1IC70	CIC 230-2 (RED)	INTEGRATED CIRCUIT	16067	3-60035	187
A1IC71	LM725-AN	INTEGRATED CIRCUIT	27014	3-60091	188
A1IC72	CIC 235	INTEGRATED CIRCUIT	16067	3-60083	189
A1IC73	CIC 235	INTEGRATED CIRCUIT	16067	3-60083	190
					191
					192
					193
					194
					195
A1K1	NOT USED				196
A1K2	NOT USED				197
A1K3	R10-E4041-1	RELAY 4FC	24796	2-45149	198
A1K4	R10-E4041-1	RELAY 4FC	24796	2-45149	199
A1K5	NOT USED				200
A1K6	R10-E4041-1	RELAY 4FC	24796	2-45149	201
A1K7	214-00003	RELAY 1FA	31951	2-45126	202
A1K8	R2204-1	RELAY 1FA	15636	2-45131	203
					204
A1L1	UF-12PE SHIELD	COIL	71707	2-45142	205
A1L2	UF-12PE SHIELD	COIL	71707	2-45142	206
A1L3	UF-12PE SHIELD	COIL	71707	2-45142	207
					208
					209
					210
					211
A1P1 THRU A1P7		NOT USED			212
A1P8A	09-18-5061	CONNECTOR 6 PIN	27264	4-10206	213
A1P8B	09-18-5061	CONNECTOR 6 PIN	27264	4-10206	214
A1P9A	09-18-5061	CONNECTOR 6 PIN	27264	4-10206	215
A1P9B	09-18-5061	CONNECTOR 6 PIN	27264	4-10206	216

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REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1P10A	09-18-5061	CONNECTOR 6 PIN	27264	4-10206	217
A1P10B	09-18-5061	CONNECTOR 6 PIN	27264	4-10206	218
A1P11	09-18-5061	CONNECTOR 6 PIN	27264	4-10206	219
A1P12	09-18-5061	CONNECTOR 6 PIN	27264	4-10206	220
A1P13	09-18-5061	CONNECTOR 6 PIN	27264	4-10206	221
A1P14 THRU A1P16		NOT USED			222
A1P17	09-52-3121	CONNECTOR 12 PIN	27264	4-10207	223
A1P18	09-52-3121	CONNECTOR 12 PIN	27264	4-10207	224
A1P19	NOT USED				225
A1P20	09-64-1122	CONNECTOR 12 PIN	27264	4-10244	226
A1P21	09-64-1122	CONNECTOR 12 PIN	27264	4-10244	227
A1P22	09-64-1122	CONNECTOR 12 PIN	27264	4-10244	228
A1P23	NOT USED				229
A1P24	CA-16S-TSD	SOCKET 16 PIN	52072	2-30057	230
A1P25	CA-16S-TSD	SOCKET 16 PIN	52072	2-30057	231
A1P26	NOT USED				232
A1P27	1261-R-2	CONNECTOR, HOUSING	27264	4-10203	233
A1P28	1261-R-2	CONNECTOR, HOUSING	27264	4-10203	234
A1P29	09-66-1121	CONNECTOR	27264	4-10245	235
					236
					237
					238
					239
A1Q1	2N5226	TRANSISTOR	81349	3-30239	240
A1Q2	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	241
A1Q3	2N5226	TRANSISTOR	81349	3-30239	242
A1Q4	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	243
A1Q5	2N5172	TRANSISTOR	56289	3-30219	244
A1Q6	PE8550	TRANSISTOR	07263	3-30288	245
A1Q7	2N5172	TRANSISTOR	56289	3-30219	246
A1Q8	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	247
A1Q9	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	248
A1Q10	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	249
A1Q11	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	250
A1Q12	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	251
A1Q13	P1087E	TRANSISTOR, F.E.T.	15818	3-30225	252

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REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1Q14	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	253
A1Q15	P1087E	TRANSISTOR, F.E.T.	15818	3-30225	254
A1Q16	U1898E	TRANSISTOR, F.E.T.	15818	3-30217	255
A1Q17	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	256
A1Q18	NOT USED				257
A1Q19	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	258
A1Q20	U1898E	TRANSISTOR, F.E.T.	15818	3-30217	259
A1Q21	P1087E	TRANSISTOR, F.E.T.	15818	3-30225	260
A1Q22	U1898E	TRANSISTOR, F.E.T.	15818	3-30217	261
A1Q23	U1898E	TRANSISTOR, F.E.T.	15818	3-30217	262
A1Q24	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	263
A1Q25	CIC 365	TRANSISTOR, F.E.T.	16067	3-30245	264
A1Q26	2N5172	TRANSISTOR	56289	3-30219	265
					266
					267
					268
					269
					270
					271
A1R1	RC07GF331J	RESISTOR 330Ω 1/4W 5%	81349	5-10041	272
A1R2	RC07GF681J	RESISTOR 680Ω 1/4W 5%	81349	5-10049	273
A1R3	RC07GF330J	RESISTOR 33Ω 1/4W 5%	81349	5-10017	274
A1R4	RC07GF331J	RESISTOR 330Ω 1/4W 5%	81349	5-10041	275
A1R5	RC07GF331J	RESISTOR 330Ω 1/4W 5%	81349	5-10041	276
A1R6	RC07GF331J	RESISTOR 330Ω 1/4W 5%	81349	5-10041	277
A1R7	RC07GF331J	RESISTOR 330Ω 1/4W 5%	81349	5-10041	278
A1R8	RC07GF331J	RESISTOR 330Ω 1/4W 5%	81349	5-10041	279
A1R9	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	280
A1R10	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	281
A1R11	RC07GF151J	RESISTOR 150Ω 1/4W 5%	81349	5-10033	282
A1R12	RC07GF151J	RESISTOR 150Ω 1/4W 5%	81349	5-10033	283
A1R13	RC07GF223J	RESISTOR 22K 1/4W 5%	81349	5-10084	284
A1R14	RC07GF223J	RESISTOR 22K 1/4W 5%	81349	5-10084	285
A1R15	RC07GF105J	RESISTOR 1M 1/4W 5%	81349	5-10123	286
A1R16	RC07GF223J	RESISTOR 22K 1/4W 5%	81349	5-10084	287
A1R17	RC07GF223J	RESISTOR 22K 1/4W 5%	81349	5-10084	288

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REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1R18	RC07GF105J	RESISTOR 1M 1/4W 5%	81349	5-10123	289
A1R19	RC07GF754J	RESISTOR 750K 1/4W 5%	81349	5-10120	290
A1R20	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	291
A1R21	RN60D1504F	RESISTOR 1.5M 1/4W 1%	81349	5-60426	292
A1R22	RN60D8253F	RESISTOR 825K 1/4W 1%	81349	5-60710	293
A1R23	RC07GF153J	RESISTOR 15K 1/4W 5%	81349	5-10080	294
A1R24	RC07GF101J	RESISTOR 100Ω 1/4W 5%	81349	5-10029	295
A1R25	RC07GF680J	RESISTOR 68Ω 1/4W 5%	81349	5-10025	296
A1R26	RC07GF680J	RESISTOR 68Ω 1/4W 5%	81349	5-10025	297
A1R27	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	298
A1R28	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	299
A1R29	NOT USED				300
A1R30	RC07GF333J	RESISTOR 33K 1/4W 5%	81349	5-10088	301
A1R31	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	302
A1R32	RC07GF101J	RESISTOR 100Ω 1/4W 5%	81349	5-10029	303
A1R33	NOT USED	RESISTOR			304
A1R34	NOT USED	RESISTOR			305
A1R35	RC07GF101J	RESISTOR 100Ω 1/4W 5%	81349	5-10029	306
A1R36	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	307
A1R37	RC07GF101J	RESISTOR 100Ω 1/4W 5%	81349	5-10029	308
A1R38	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	309
A1R39	RC07GF225J	RESISTOR 2.2M 1/4W 5%	81349	5-10126	310
A1R40	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	311
A1R41	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	312
A1R42	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	313
A1R43	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	314
A1R44	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	315
A1R45	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	316
A1R46	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	317
A1R47	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	318
A1R48	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	319
A1R49	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	320
A1R50	RC07GF181J	RESISTOR 180Ω 1/4W 5%	81349	5-10035	321
A1R51	RC07GF223J	RESISTOR 22K 1/4W 5%	81349	5-10084	323
A1R52	RC07GF181J	RESISTOR 180Ω 1/4W 5%	81349	5-10035	324
A1R53	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	325

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REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1R54	RC07GF181J	RESISTOR 180Ω 1/4W 5%	81349	5-10035	326
A1R55	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	327
A1R56	RN55C1823F	RESISTOR 182K 1% 1/10W	81349	5-60724	328
A1R57	NOT USED				329
A1R58	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	330
A1R59	RC07GF101J	RESISTOR 100Ω 1/4W 5%	81349	5-10029	331
A1R60	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	332
A1R61	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	333
A1R62	RC07GF105J	RESISTOR 1M 1/4W 5%	81349	5-10123	334
A1R63	ET34X203	POTENTIOMETER 20K	30983	5-70223	335
A1R64	RC07GG223J	RESISTOR 22K 1/4W 5%	81349	5-10084	336
A1R65	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	337
A1R66	RC07GF913J	RESISTOR 91K 1/4W 5%	81349	5-10099	338
A1R67	RC42GF104J	RESISTOR 100K 2W 5%	81349	5-40015	339
A1R68	RC07GF332J	RESISTOR 3.3K 1/4W 5%	81349	5-10064	340
A1R69	RC07GF152J	RESISTOR 1.5K 1/4W 5%	81349	5-10057	341
A1R70	CIC 512	RESISTOR 9.975K .1%	16067	5-60614	342
A1R71	CIC 512	RESISTOR 89.725K .1%	16067	5-60614	343
A1R72	CIC 512	RESISTOR 897.25K .1%	16067	5-60614	344
A1R73	CIC 512	RESISTOR 8.9976M .1%	16067	5-60614	345
A1R74	91AR50Ω	POTENTIOMETER 50Ω	73138	5-70201	346
A1R75	91AR500Ω	POTENTIOMETER 500Ω	73138	5-70220	347
A1R76	RN60C4991F	RESISTOR 4.99K 1% 1/8W	81349	5-60238	348
A1R77	RC07GF102J	RESISTOR 1K 1/4W 5%	81349	5-10053	349
A1R78	RC07GF682J	RESISTOR 6.8K 1/4W 5%	81349	5-10072	350
A1R79	RC07GF102J	RESISTOR 1K 1/4W 5%	81349	5-10053	351
A1R80	RC07GF682J	RESISTOR 6.8K 1/4W 5%	81349	5-10072	352
A1R81	91AR100K	POTENTIOMETER 100K	73138	5-70221	353
A1R82	RC07GF225J	RESISTOR 2.2M 1/4W 5%	81349	5-10126	354
A1R83	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	355
A1R84	RC07GF105J	RESISTOR 1M 1/4W 5%	81349	5-10123	356
A1R85	RC07GF105J	RESISTOR 1M 1/4W 5%	81349	5-10123	357
A1R86	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	358
A1R87	RC07GF223J	RESISTOR 22K 1/4W 5%	81349	5-10084	359
A1R88	RC07GF105J	RESISTOR 1M 1/4W 5%	81349	5-10123	360
A1R89	RC07GF182J	RESISTOR 1.8K 1/4W 5%	81349	5-10058	361

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REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1R90	CIC 709	RESISTOR (MATCHED SET)	16067	3-10225	362
A1R91	3299W-1-203	POTENTIOMETER 20K	80294	5-70226	363
A1R92	RC07GF105J	RESISTOR . 1M 1/4W 5%	81349	5-10123	364
A1R93	RC07GF106J	RESISTOR 10M 1/4W 5%	81349	5-10135	365
A1R94	RC07GF105J	RESISTOR 1M 1/4W 5%	81349	5-10123	366
A1R95	NOT USED				367
A1R96	RC07GF224J	RESISTOR 220K 1/4W 5%	81349	5-10108	368
A1R97	OB-9K . 05% 5PPM	RESISTOR 9K , 05% 5PPM	07088	5-80337	369
A1R98	EP21-4.99K1%-15PPM	RESISTOR 4. 99K 1% 15PPM	07088	5-80373	370
A1R99	91AR100Ω	POTENTIOMETER 100Ω	73138	5-70205	371
A1R100	OB-9K . 05% 5PPM	RESISTOR 9K . 05% 5PPM	07088	5-80337	372
A1R101	RC07 TBD	RESISTOR TBD	81349		373
A1R102	RC07GF512J	RESISTOR 5. 1K 1/4W 5%	81349	5-10069	374
A1R103	OB-9K . 05% 5PPM	RESISTOR 9K . 05% 5PPM	07088	5-80337	375
A1R104	91AR20Ω	POTENTIOMETER 20Ω	73138	5-70206	376
A1R105	RC07GF512J	RESISTOR 5. 1K 1/4W 5%	81349	5-10069	377
A1R106	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	378
A1R107	RC07GF153J	RESISTOR 15K 1/4W 5%	81349	5-10080	379
A1R108	3299W-1-203	POTENTIOMETER 20K	80294	5-70226	380
A1R109	OB-9K . 05% 5PPM	RESISTOR 9K . 05% 5PPM	07088	5-80337	381
A1R110	91AR20Ω	POTENTIOMETER 20Ω	73138	5-70206	382
A1R111	OB-1K . 05% 5PPM	RESISTOR 1K . 05% 5PPM	07088	5-80412	383
A1R112	RC07GF912J	RESISTOR 9. 1K 1/4W 5%	81349	5-10075	384
A1R113	RC07GF103J	RESISTOR 1K 1/4W 5%	81349	5-10053	385
A1R114	OA-50K . 01% 5PPM	RESISTOR 50K . 01% 5PPM	07088	5-80409	386
A1R115	RC07GF513J	RESISTOR 51K 1/4W 5%	81349	5-10093	387
A1R116	RC07GF474J	RESISTOR 470K 1/4W 5%	81349	5-10115	388
A1R117	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	389
A1R118	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	390
A1R119	OB-250K . 1% 5PPM	RESISTOR 250K . 1% 5PPM	07088	5-80413	391
A1R120	OB-249K . 1% 5PPM	RESISTOR 249K . 1% 5PPM	07088	5-80414	392
A1R121	91AR2K	POTENTIOMETER 2K	73138	5-70222	393
A1R122	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	394
A1R123	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	395
A1R124	91AR20Ω	POTENTIOMETER 20Ω	73138	5-70206	396
A1R125	RN60D1302F	RESISTOR 13K 1/4W 1%	81349	5-60090	397

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REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITE NO
A1R126	RN55D54R9F	RESISTOR 54.9Ω 1% 1/8 W	81349	5-60717	3
A1R127	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	3
A1R128	RN55D1000F	RESISTOR 100Ω 1% 1/8W	81349	5-60684	1
A1R129	RN55D54R9F	RESISTOR 54.9Ω 1% 1/8W	81349	5-60717	4
A1R130	91AR20Ω	POTENTIOMETER 20Ω	73138	5-70206	4
A1R131	RN60D1302F	RESISTOR 13K 1% 1/4W	81349	5-60090	4
A1R132	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	4
A1R133	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	4
A1R134	RC07GF681J	RESISTOR 680Ω 1/4W 5%	81349	5-10049	4
A1R135	RC07GF152J	RESISTOR 1.5K 1/4W 5%	81349	5-10057	4
A1R136	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	4
A1R137	RC07GF223J	RESISTOR 22K 1/4W 5%	81349	5-10084	4
A1R138	RC07GF223J	RESISTOR 22K 1/4W 5%	81349	5-10084	4
A1R139	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	4
A1R140	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	4
A1R141	RC07GF102J	RESISTOR 1K 1/4W 5%	81349	5-10053	4
A1R142	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	4
A1R143	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	4
A1R144	RC07GF105J	RESISTOR 1M 1/4W 5%	81349	5-10123	4
A1R145	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	4
A1R146	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	4
A1R147	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	4
A1R148	NOT USED				4
A1R149	RC07GF151J	RESISTOR 150Ω 1/4W 5%	81349	5-10033	4
A1R150	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	4
A1R151	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	4
A1R152	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	4
A1R153	NOT USED	RESISTOR			4
A1R154	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	4
A1R155	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	4
A1R156	RC07GF333J	RESISTOR 33K 1/4W 5%	81349	5-10088	4
A1R157	RC07GF333J	RESISTOR 33K 1/4W 5%	81349	5-10088	4
A1R158	RC07GF102J	RESISTOR 1K 1/4W 5%	81349	5-10053	4
A1SR1	MR-108-15/25AT	SWITCH, REED	95348	2-45143	4
A1SR2	MR-108-15/25AT	SWITCH, REED	95348	2-45143	4
A1SR3	MR-138-15/25AT	SWITCH, REED	95348	2-45144	4

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A1S1	B8544-013	SWITCH (PWR ON-OFF)	16067	2-40464	434
A1S2	NOT USED				435
A1S3	C8544-012	SWITCH (RANGE)	16067	2-40463	436
					437
					438
A1Y1	ER-1213	CRYSTAL 1.2 MHz	13571	2-50226	439
	27E194	RELAY SOCKET (4FC)	24796	2-45154	440
	8544-206-7	SHIELD	16067	1-10561	441
	02-09-2132	PIN-MALE	27264	4-10204	442
	02-09-1132	PIN-FEMALE	27264	4-10205	443
	2010C-1	TERMINAL	88245	2-50291	444
	FT-E-15	CLOVERLEAF, FEF. INSUL.	98291	2-50292	445
	1310C-1	TERMINAL, BIFURCATED	88245	2-50305	446
	FT-2-SM-1164SL	TERMINAL, INSUL. FD. THRU	98291	2-50227	447
	1300C-1	TERMINAL	88245	2-50290	448
	10274	CRYSTAL PAD	0000W	2-10521	449
	MS9596-005	ANGLE BRACKET	18076	1-10502	450
	J76115-00 1/8THK	SPACER, DOG-BONE	71590		451
	8097-A-0440	SPACER 3/16O.D. x $1\frac{3}{4}$ LG.	06546	2-10488	452
	1300-17	SPACER 1/4O.D. x 1/8 LG	71279	2-10597	453
	24 AWG	BUSS WIRE			454
	24 GA	TEFLON SLEEVING (1000V)			455
	WRN - 31/2 NAT	CABLE TIE	51705		456
	4-40 x 3/8	SCREW, PAN HD			457
	10-32 x 1/4	SCREW, PAN HD			458
	#10	WASHER, INT. STR.			459
	#10-32	NUT			460
	#4	WAHSER, INT. STR.			461
					462
	24 GA/WHT/1000V	WIRE, TEFLON INSULATED			463
					464
					465
					466
					467
	20C250	HOLD DOWN SPRING 4FC	24796	2-45152	468
					469

MODEL DSM 44 — CALICO P/N 8544-700 — ASSY R.D. A1

TITLE DIGITAL/ANALOG BOARD ASSEMBLY — SHT 16 OF 16

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A2	8544-701-1	P.C. BD DISPLAY ASSY	16067		1
	-7	P.C. BOARD MECH.	16067	1-60237	2
					3
					4
					5
					6
A2DS1	SP351	DISPLAY, POL./NUM.	07713	2-30062	7
A2DS2	SP353	DISPLAY, NUMERICAL	07713	2-30063	8
A2DS3	LSL-3L	L.E.D.	0000S	2-50212	9
A2DS4	LSL-3L	L.E.D.	0000S	2-50212	10
A2DS5	LSL-3L	L.E.D.	0000S	2-50212	11
A2DS6	LSL-3L	L.E.D.	0000S	2-50212	12
A2DS7	LSL-3L	L.E.D.	0000S	2-50212	13
A2DS8	LSL-3L	L.E.D.	0000S	2-50212	14
A2DS9	LSL-3L	L.E.D.	0000S	2-50212	15
A2DS10	5082-4555	L.E.D., YELLOW	28480	2-50299	16
					17
					18
					19
					20
					21
					22
A2IC1	SN7441AN	INTEGRATED CIRCUIT	81349	3-60003	23
A2IC2	DD700	INTEGRATED CIRCUIT	07713	3-60053	24
A2IC3	DD700	INTEGRATED CIRCUIT	07713	3-60053	25
A2IC4	DD700	INTEGRATED CIRCUIT	07713	3-60053	26
A2IC5	DD700	INTEGRATED CIRCUIT	07713	3-60053	27
					28
A2J1 THRU A2J28		NOT USED			29
A2J29	09-52-3122	CONNECTOR, 12 PIN	27264	4-10242	30
					31
A2Q1	2N5550	TRANSISTOR	81349	3-30255	32
A2Q2	2N5550	TRANSISTOR	81349	3-30255	33
A2Q3	2N5550	TRANSISTOR	81349	3-30255	34
A2Q4	2N5172	TRANSISTOR	56289	3-30219	35
					36

MODEL DSM 44 — CALICO P/N 8544-701 — ASSY R.D. A2

TITLE DISPLAY BOARD ASSEMBLY — SHT 4 OF 5

CALICO | CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA | CODE IDENT 16067 | **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
					37
A2R1	RC07GF225J	RESISTOR 2.2M 1/4W 5%	81349	5-10126	38
A2R2	RC07GF334J	RESISTOR 330K 1/4W 5%	81349	5-10112	39
A2R3	RC07GF225J	RESISTOR 2.2M 1/4W 5%	81349	5-10126	40
A2R4	RC07GF334J	RESISTOR 330K 1/4W 5%	81349	5-10112	41
A2R5	RC07GF225J	RESISTOR 2.2M 1/4W 5%	81349	5-10126	42
A2R6	RC07GF334J	RESISTOR 330K 1/4W 5%	81349	5-10112	43
A2R7	RC07GF225J	RESISTOR 2.2M 1/4W 5%	81349	5-10126	44
A2R8	RC07GF334J	RESISTOR 330K 1/4W 5%	81349	5-10112	45
A2R9	RC07GF225J	RESISTOR 2.2M 1/4W 5%	81349	5-10126	46
A2R10	RC07GF334J	RESISTOR 330K 1/4W 5%	81349	5-10112	47
A2R11	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	48
A2R12	RC07GF683J	RESISTOR 68K 1/4W 5%	81349	5-10096	49
A2R13	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	50
A2R14	RC07GF134J	RESISTOR 130K 1/4W 5%	81349	5-10103	51
A2R15	RC07GF114J	RESISTOR 110K 1/4W 5%	81349	5-10101	52
A2R16	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	53
A2R17	RC07GF114J	RESISTOR 110K 1/4W 5%	81349	5-10101	54
A2R18	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	55
A2R19	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	56
A2R20	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	57
A2R21	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	58
A2R22	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	59
A2R23	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	60
A2R24	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	61
A2R25	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	62
A2R26	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	63
A2R27	RC07GF331J	RESISTOR 330Ω 1/4W 5%	81349	5-10041	64
A2R28	RC07GF331J	RESISTOR 330Ω 1/4W 5%	81349	5-10041	65
A2R29	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	66
					67
					68
					69
					70
	CA-16S-TSD	SOCKET 16-PIN	52072	2-30057	71
					72

MODEL	CALICO P/N	ASSY R.D.
DSM 44	8544-701	
TITLE	SHT	OF
DISPLAY P.C. BOARD ASSEMBLY	5	5
		A2

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067 — **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A3	8544-702-1	AC CONVERTER ASSY	16067		1
	8544-702-7	P.C. BOARD	16067	1-60238	2
		EYELET (SEE SHEET 3)			3
					4
					5
A3C1	CM05E560J03	CAPACITOR 56pF 500V	81349	6-10017	6
A3C2	2222-809-05002	CAPACITOR VAR. 1.8-10pF	80031	6-10940	7
A3C3	CM05E510J03	CAPACITOR 51pF 500V	81349	6-10016	8
A3C4	ZA2G254	CAPACITOR .25μF 600V	27556	6-10570	9
A3C5	HT10KA/29	CAPACITOR VAR. 2-9pF	80031	6-10975	10
A3C6	CM05D100J03	CAPACITOR 10pF 500V	81349	6-10004	11
A3C7	HT10KA/218	CAPACITOR VAR. 2-18pF	80031	6-10943	12
A3C8	CM06F471J03	CAPACITOR 470pF 500V	81349	6-10291	13
A3C9	CM05E300J03	CAPACITOR 30pF 500V	81349	6-10263	14
A3C10	HT10MA/550	CAPACITOR VAR. 5-50pF	80031	6-10919	15
A3C11	DM19-512F	CAPACITOR 5100pF 500V 1%	72136	6-10516	16
A3C12	CM06F431J03	CAPACITOR 430pF 500V	81349	6-10290	17
A3C13	PA2A563F	CAPACITOR .056μF 50V 1%	27556	6-10980	18
A3C14	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	19
A3C15	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	20
A3C16	CM05F151F03	CAPACITOR 150pF 500V	81349	6-10030	21
A3C17	DM5CC070K	CAPACITOR 7pF 300V	72136	6-10968	22
A3C18	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	23
A3C19	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	24
A3C20	PD5A104K	CAPACITOR .1μF 50V	12406	6-10958	25
A3C21	PA2A503J	CAPACITOR .05μF 50V 5%	27556	6-10451	26
A3C22	CM05CD010D03	CAPACITOR 1pF 500V	81349	6-10905	27
A1CR1	1N4148	DIODE	25403	3-10227	28
A1CR2	1N4148	DIODE	25403	3-10227	29
A1CR3	1N4148	DIODE	25403	3-10227	30
A1CR4	1N4148	DIODE	25403	3-10227	31
A1CR5	1N4148	DIODE	25403	3-10227	32
A1CR6	1N4148	DIODE	25403	3-10227	33
A1CR7	1N270	DIODE	81349	3-10006	34
A1CR8	FH1100	DIODE	07263	3-10212	35
					36

MODEL DSM44-Option 01 — CALICO P/N 8544-702 — ASSY R.D. A3

TITLE AC CONVERTER ASSEMBLY — SHT 4 OF 7

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
					37
					38
A3IC1	LF356H	INTEGRATED CIRCUIT	27014	3-60094	39
A3IC2	CIC 235	INTEGRATED CIRCUIT	16067	3-60083	40
A3IC3	LM301AT	INTEGRATED CIRCUIT	18324	3-60137	41
A3IC4	LF356H	INTEGRATED CIRCUIT	27014	3-60094	42
					43
					44
					45
A3J1 THRU A3J7		NOT USED			46
A3J8	1261-R-2	CONNECTOR, 6-PIN	27264	4-10203	47
A3J9	1261-R-2	CONNECTOR, 6-PIN	27264	4-10203	48
A3J10	1261-R-2	CONNECTOR, 6-PIN	27264	4-10203	49
					50
					51
					52
A3K1	223-00002	RELAY 2 FORM A	31951	2-45136	53
A3K2	223-00001	RELAY 1 FORM A	31951	2-45135	54
A3K3	214-00003	RELAY 1 FORM A	31951	2-45126	55
A3K4	214-00003	RELAY 1 FORM A	31951	2-45126	56
A3K5	214-00003	RELAY 1 FORM A	31951	2-45126	57
					58
					59
A3Q1	CIC 365	F.E.T.	16067	3-30245	60
A3Q2	CIC 365	F.E.T.	16067	3-30245	61
					62
					63
					64
A3R1	CIC 517 *	RESISTOR 1M 1W .5%	16067	5-80393	65
A3R2	RC07GF101J	RESISTOR 100Ω 1/4W 5%	81349	5-10029	66
A3R3	RC07GF107K	RESISTOR 100M 1/4W 10%	81349	5-10145	67
A3R4	CIC 517 *	RESISTOR 1M 1/3W .5%	16067	5-80393	68
A3R5	CIC 517 *	RESISTOR 54.5K 1/3W .5%	16067	5-80393	69
A3R6	91AR2K	RESISTOR VAR. 2K	73138	5-70222	70
A3R7	RC07GF561J	RESISTOR 560Ω 1/4W 5%	81349	5-10047	71
* PART OF MATCHED SET		R1, R4, R5, R8 and R11			72

MODEL DSM 44-Option 01 — CALICO P/N 8544-702 — ASSY R.D.

TITLE AC CONVERTER ASSEMBLY — SHT 5 OF 7 — A3

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A3R8	CIC 517 *	RESISTOR 4.95K 1/3W .5%	16067	5-80393	73
A3R9	91AR200Ω	RESISTOR VAR. 200Ω	73138	5-70238	74
A3R10	RC07GF560J	RESISTOR 56Ω 1/4W 5%	81349	5-10023	75
A3R11	CIC 517 *	RESISTOR 490Ω 1/3W .5%	16067	5-80393	76
A3R12	91AR20Ω	RESISTOR VAR. 20Ω	73138	5-70206	77
A3R13	RC07GF8R2J	RESISTOR 8.2Ω 1/4W 5%	81349	5-10163	78
A3R14	91AR1K	RESISTOR VAR. 1K	73138	5-70204	79
A3R15	CIC 518 **	RESISTOR 10K .1%	16067	5-80394	80
A3R16	RC07GF223J	RESISTOR 22K 1/4W 5%	81349	5-10084	81
A3R17	3299W-1-503	RESISTOR VAR. 50K	80294	5-70244	82
A3R18	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	83
A3R19	RC07GF822J	RESISTOR 8.2K 1/4W 5%	81349	5-10074	84
A3R20	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	85
A3R21	CIC 518 **	RESISTOR 43.4K .1%	16067	5-80394	86
A3R22	3299W-1-202	RESISTOR VAR. 2K	80294	5-70227	87
A3R23	3299W-1-503	RESISTOR VAR. 50K	80294	5-70244	88
A3R24	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	89
A3R25	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	90
A3R26	CIC 518 **	RESISTOR 10K .1%	16067	5-80394	91
A3R27	CIC 518 **	RESISTOR 5K .1%	16067	5-80394	92
A3R28	RC07GF332J	RESISTOR 3.3K 1/4W 5%	81349	5-10064	93
A3R29	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	94
A3R30	RC07GF331J	RESISTOR 330Ω 1/4W 5%	81349	5-10041	95
A3R31	CIC 518 **	RESISTOR 15K .1%	16067	5-80394	96
A3R32	RC07GF513J	RESISTOR 51K 1/4W 5%	81349	5-10093	97
A3R33	RC07GF513J	RESISTOR 51K 1/4W 5%	81349	5-10093	98
A3R34	3299W-1-203	POT, MULTI-TURN, 20K	80294	5-70226	99
A3R35	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	100
					101
*	PART OF MATCHED SET R1, R4, R5, R8 and R11.				102
**	PART OF MATCHED SET R15, R21, R26, R27 and R31				103
					104
					105
					106
					107
					108

MODEL DSM 44-Option 01 — CALICO P/N 8544-702 — ASSY R.D. A3

TITLE AC CONVERTER ASSEMBLY — SHT 6 OF 7

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
	02-09-2132	CONN. CONTACT, MALE	27264	4-10204	109
	02-09-1132	CONN. CONTACT, FEMALE	27264	4-10205	110
	8248	STANDOFF #6, 1/4 LG	83330	2-10496	111
	2323	STANDOFF #6, 3/4 LG	83330	2-10255	112
					113
					114
					115
	8542-204-7	SHIELD, BOTTOM	16067	1-10427	116
	8544-211-7	SHIELD, TOP	16067	1-10570	117
	2010B-1	TERMINAL, TURRET	88245	2-50076	118
					119
					120
					121
					122
					123
	6-32UNC x 1/4 LG	SCREW, PAN HD			124
					125
	#6	LOCKWASHER, INT STAR			126
					127
					128
	AWG 24	BUSS WIRE			129
	24 GA	TEFLON SLEEVING			130
					131
					132
					133
					134
					135
					136
					137
					138
					139
					140
					141
					142
					143
					144

MODEL DSM 44-Option 01 — CALICO P/N 8544-702 — ASSY R.D

TITLE AC CONVERTER ASSEMBLY — SHT 7 OF 7 — A3

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A4	8544-703-1	OHMS CONVERTER ASSY	16067	---	1
	8544-703-7	P.C. BOARD	16067	1-60239	2
		EYELET (SEE SHEET 3)			3
					4
					5
A4C1	T362B106M025AS	CAPACITOR 10μF 25V	05397	6-10738	6
A4C2	T362B106M025AS	CAPACITOR 10μF 25V	05397	6-10738	7
A4C3	CM05E300J03	CAPACITOR 30pF 500V	81349	6-10263	8
A4C4	CK103	CAPACITOR .01μF 50V	71590	6-10094	9
A4C5	CM05E200J03	CAPACITOR 20pF 500V	81349	6-10008	10
A4C6	SX210	CAPACITOR 1000pF 600V	90201	6-10910	11
A4C7	CK103	CAPACITOR .01μF 50V	71590	6-10094	12
A4C8	SX210	CAPACITOR 1000 pF 600V	90201	6-10910	13
					14
A4CR1	1N4148	DIODE	25403	3-10227	15
A4CR2	1N4148	DIODE	25403	3-10227	16
A4CR3	1N4148	DIODE	25403	3-10227	17
A4CR4	1N4148	DIODE	25403	3-10227	18
A4CR5	1N4148	DIODE	25403	3-10227	19
A4CR6	1N4148	DIODE	25403	3-10227	20
A4CR7	1N4148	DIODE	25403	3-10227	21
A4CR8	1N5740B	DIODE, ZENER	25403	3-10241	22
A4CR9	1N5740B	DIODE, ZENER	25403	3-10241	23
A4CR10	IN4148	DIODE,	25403	3-10227	24
A4CR11	CIC 725	DIODE, ZENER *	16067	3-10230	25
A4CR12	1N4148	DIODE	25403	3-10227	26
A4CR13	1N4148	DIODE	25403	3-10227	27
A4CR14	1N4148	DIODE	25403	3-10227	28
A4CR15	1N4148	DIODE	25403	3-10227	29
A4CR16	1N4007	DIODE	04713	3-10155	30
A4CR17	1N5226	DIODE, ZENER	04713	3-10222	31
A4CR18	1N4148	DIODE	25403	3-10227	32
A4CR19	1N4148	DIODE	25403	3-10227	33
A4CR 20	IN4148	DIODE	25403	3-10227	34
A4CR 21	IN4148	DIODE	25403	3-10227	35
	* PART OF MATCHED DIODE/RESISTOR SET				36

MODEL	CALICO P/N	ASSY R.D.
DSM 44-Option 05	8544-703	A4
TITLE OHMS CONVERTER ASSEMBLY	SHT 4 OF 7	

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA

CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A4IC1	CIC 232	INTEGRATED CIRCUIT	16067	3-60136	37
A4IC2	LM748CN	INTEGRATED CIRCUIT	27014	3-60086	38
A4IC3	LM748CN	INTEGRATED CIRCUIT	27014	3-60086	39
					40
					41
					42
					43
					44
A4J1 THRU A4J10		NOT USED ON THIS ASSY			45
A4J11	1261-R-2	CONNECTOR, 6-PIN	27264	4-10203	46
A4J12	1261-R-2	CONNECTOR, 6-PIN	27264	4-10203	47
A4J13	1261-R-2	CONNECTOR, 6-PIN	27264	4-10203	48
					49
					50
A4K1	223-00002	RELAY 2 FORM A	31951	2-45136	51
A4K2	223-00001	RELAY 1 FORM A	31951	2-45135	52
A4K3	214-00008	RELAY 2 FORM A	31951	2-45127	53
A4K4	214-00003	RELAY 1 FORM A	31951	2-45126	54
A4K5	214-00003	RELAY 1 FORM A	31951	2-45126	55
A4K6	214-00003	RELAY 1 FORM A	31951	2-45126	56
A4K7	214-00003	RELAY 1 FORM A	31951	2-45126	57
					58
					59
A4Q1	PN2222A	TRANSISTOR	07263	3-30284	60
A4Q2	PN2907A	TRANSISTOR	07263	3-30285	61
A4Q3	CIC 365	FET	16067	3-30245	62
A4Q4	CIC 365	FET	16067	3-30245	63
A4Q5	PN2907A	TRANSISTOR	02763	3-30285	64
A4Q6	DTS 714	TRANSISTOR	16758	3-30286	65
					66
					67
					68
					69
					70
					71
					72

MODEL DSM 44-Option 05 | CALICO P/N 8544-703 | ASSY R.D.

TITLE OHMS CONVERTER ASSEMBLY | SHT 5 OF 7 | A4

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A4R1	RC20GF470J	RESISTOR 47Ω 1/2W 5%	81349	5-20013	73
A4R2	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	74
A4R3	RC07GF222J	RESISTOR 2.2K 1/4W 5%	81349	5-10060	75
A4R4	RC20GF470J	RESISTOR 47Ω 1/2W 5%	81349	5-20013	76
A4R5	RN60C4751F	RESISTOR 4.75K 1/8W 1%	81349	5-60412	77
A4R6	EP-21	RESISTOR 102Ω 1/4W .1%	07088	5-80289	78
A4R7	3299W-1-501	RESISTOR, VAR. 500Ω	80294	5-70213	79
A4R8	EP-21	RESISTOR, 998.5Ω 1/4W .1%	07088	5-80290	80
A4R9	RN60D10R0F	RESISTOR 10Ω 1/4W 1%	81349	5-60455	81
A4R10	91AR10Ω	RESISTOR, VAR. 10Ω	73138	5-70202	82
A4R11	EP-21	RESISTOR 9.985K 1/4W .1%	07088	5-80291	83
A4R12	91AR50Ω	RESISTOR, VAR. 50Ω	73138	5-70201	84
A4R13	EP-21	RESISTOR, 100.76K 1/4W .1%	07088	5-80292	85
A4R14	91AR500Ω	RESISTOR, VAR. 500Ω	73138	5-70220	86
A4R15	EP-21	RESISTOR, 1.1086M1/4W.1%	07088	5-80293	87
A4R16	91AR5K	RESISTOR, VAR. 5K	73138	5-70219	88
A4R17	91AR50Ω	RESISTOR, VAR. 50Ω	73138	5-70201	89
A4R18	RC07GF330J	RESISTOR 33Ω 1/4W 5%	81349	5-10017	90
A4R19	RC07GF102J	RESISTOR 1K 1/4W 5%	81349	5-10053	91
A4R20	EP-20	RESISTOR 975Ω 1/8W .1%	07088	5-80165	92
A4R21	PME80T9-9.95M-.25%	RESISTOR 9.95M .25% 25PPM	03888	5-80297	93
A4R22	91AR100K	RESISTOR, VAR 100K.	73138	5-70221	94
A4R23	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	95
A4R24	RC20GF105J	RESISTOR 1M 1/2W 5%	81349	5-20092	96
A4R25	RC07GF153J	RESISTOR 15K 1/4W 5%	81349	5-10080	97
A4R26	RC07GF 752J	RESISTOR 7.5K 1/4W 5%	81349	5-10073	98
A4R27	EP-21	RESISTOR 5.325K 1/4W .1%	07088	5-80296	99
A4R28	CIC 725	RESISTOR *	16067	3-10230	100
A4R29	RC07GF162J	RESISTOR 1.6K 1/4W 5%	81349	5-10158	101
A4R30	RN60C4531F	RESISTOR 4.53K 1/8W 1%	81349	5-60570	102
A4R31	91AR500Ω	RESISTOR, VAR. 500Ω	73138	5-70220	103
A4R32	RN60D2491F	RESISTOR 2.49K 1/4W 1%	81349	5-60363	104
A4R33	RC07GF512J	RESISTOR 5.1K 1/4W 5%	81349	5-10069	105
A4R34	RC07GF473J	RESISTOR 47K 1/4W 5%	81349	5-10092	106
A4R35	RC07GF472J	RESISTOR 4.7K 1/4W 5%	81349	5-10068	107
	* PART OF RESISTOR/DIODE MATCHED SET				108

MODEL DSM 44-Option 05 — CALICO P/N 8544-703 — ASSY R.D. A4

TITLE OHMS CONVERTER ASSEMBLY — SHT 6 OF 7

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA | CODE IDENT 16067 | **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A4R36	RC07GF102J	RESISTOR 1K 1/4W 5%	81349	5-10053	10
					11
	8544-209-7	SHIELD, TOP	16067	1-10558	11
	8544-210-7	SHIELD, BOTTOM	16067	1-10559	11
					11
					11
	02-09-2132	CONN. PIN, MALE	27264	4-10204	11
	02-09-1132	CONN. PIN, FEMALE	27264	4-10205	11
	2323	STANDOFF 6-32 x 3/4LG	83330	2-10255	11
	8248	STANDOFF 6-32 x 1/4LG	83330	2-10496	11
	FT-2-SM-1164SL	TERMINAL,INSUL, FEEDTHRU	98291	2-50227	11
	2010B-1	TERMINAL, TURRET	88245	2-50076	12
	1416-8	SOLDER LUG	83330	2-50053	12
	FT-E-15	CLOVERLEAF, TFE INSUL	98291	2-50292	12
	FT-MM-L-10	CENTER PIN, CLOVERLEAF	98291	2-50293	12
					12
					12
	6-32UNC x 1/4LG	SCREW, PAN HD			12
	6-32UNC x 3/8LG	SCREW, PAN HD			12
	6-32 UNC	HEX NUT			12
	#6	LOCKWASHER, INT STAR			12
					13
					13
					13
	2831/2	2 COND. TFL. SHLD.	92194		13
					13
	24 AWG	BUSS WIRE			13
	24 GA	TEFLON SLEEVING			13
					13
	24 AWG-BLK	WIRE, INSUL			13
	3/16 ID	SHRINK TUBING			13
		CABLE TIE			14
					14
					14
					14
					14

MODEL DSM 44-Option 05 | CALICO P/N 8544-703 | ASSY R.D. A4

TITLE OHMS CONVERTER ASSEMBLY | SHT 7 OF 7

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067 — **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A7	8544-705-1	POWER SUPPLY BD ASSY	16067		1
	8544-705-7	P.C. BOARD	16067	1-60235	2
					3
		EYELET (SEE SHEET 3)			4
					5
					6
A7C1	ZD2A105K	CAPACITOR 1μF 200V 10%	12406	6-10591	7
A7C2	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	8
A7C3	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	9
A7C4	39D668G015JS4	CAPACITOR 6600μF 15V	56289	6-10825	10
A7C5	T362C476M015AS	CAPACITOR 47μF 15V	05397	6-10877	11
A7C6	C43[illegible]AR/N25	CAPACITOR 25μF 300V	80031	6-10934	12
A7C7	066GJ501U040B	CAPACITOR 500μF 40V	00853	6-10912	13
A7C8	066GJ501U040B	CAPACITOR 500μF 40V	00853	6-10912	14
A7C9	TE1309	CAPACITOR 100μF 50V	56289	6-10782	15
A7C10	TE1309	CAPACITOR 100μF 50V	56289	6-10782	16
A7C11	T362B106M025AS	CAPACITOR 10μF 25V	05397	6-10738	17
A7C12	T362B106M025AS	CAPACITOR 10μF 25V	05397	6-10738	18
A7C13	T362C476M015AS	CAPACITOR 47μF 15V	05397	6-10877	19
					20
					21
					22
					23
A7CR1	20A2	DIODE	07716	3-10213	24
A7CR2	20A2	DIODE	07716	3-10213	25
A7CR3	1N4148	DIODE	25403	3-10227	26
A7CR4	1N4148	DIODE	25403	3-10227	27
A7CR5	1N4004	DIODE	04713	3-10062	28
A7CR6	1N4001	DIODE	04713	3-10172	29
A7CR7	1N4001	DIODE	04713	3-10172	30
A7CR8	1N4001	DIODE	04713	3-10172	31
A7CR9	1N4001	DIODE	04713	3-10172	32
A7CR10	1N4148	DIODE	25403	3-10227	33
A7CR11	1N4148	DIODE	25403	3-10227	34
A7CR12	1N4148	DIODE	25403	3-10227	35
A7CR13	1N4148	DIODE	25403	3-10227	36

MODEL DSM 44 — CALICO P/N 8544-705 — ASSY R.D. A7

TITLE POWER SUPPLY BOARD ASSEMBLY — SHT 4 OF 6

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A7CR14	1N5730B	DIODE, ZENER	25403	3-10234	37
A7CR15	1N5247	DIODE, ZENER	04713	3-10205	38
A7CR16	1N5247	DIODE, ZENER	04713	3-10205	39
					40
					41
A7IC1	LM309K	VOLTAGE REGULATOR	27014	3-60007	42
A7IC2	LM341P-6.0	INTEGRATED CIRCUIT	27014	3-60140	43
					44
A7J1 THRU A7J14		NOT USED ON THIS ASSY			45
A7J15	09-80-1123	CONNECTOR STRIP	27264	4-10265	46
A7J16		NOT USED ON THIS ASSY			47
A7J17	09-75-1121	CONNECTOR STRIP, 90°	27264	4-10240	48
A7J18	09-75-1121	CONNECTOR STRIP, 90°	27264	4-10240	49
A7J19	09-80-1123	CONNECTOR STRIP	27264	4-10265	50
A7P1 THRU A7P29		NOT USED ON THIS ASSY			51
A7P30	09-64-1042	CONN, 4-PIN	27264	4-10268	52
					53
A7Q1	NOT USED				54
A7Q2	T1P29	TRANSISTOR	01295	3-30241	55
A7Q3	T1P29	TRANSISTOR	01295	3-30241	56
A7Q4	T1P30	TRANSISTOR	01295	3-30250	57
					58
A7R1	4373	RESISTOR 30Ω 3W 5%	44655	5-50018	59
A7R2	4396	RESISTOR 150Ω 3 1/4W	44655	5-50027	60
A7R3	RC07GF332J	RESISTOR 3.3K 1/4W 5%	81349	5-10064	61
A7R4	RC32GF5R1J	RESISTOR 5.1Ω 1W 5%	81349	5-30050	62
A7R5	RC07GF471J	RESISTOR 470Ω 1/4W 5%	81349	5-10045	63
A7R6	RC07GF471J	RESISTOR 470Ω 1/4W 5%	81349	5-10045	64
A7R7	RC32GF5R1J	RESISTOR 5.1Ω 1W 5%	81349	5-30050	65
A7R8	NOT USED				66
A7R9	RC07GF333J	RESISTOR 33K 1/4W 5%	81349	5-10088	67
A7R10	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	68
A7R11	RC20GF184J	RESISTOR 180K 5% 1/2W	81349	5-20080	69
					70
					71
					72

MODEL DSM 44 — CALICO P/N 8544-705 — ASSY R.D. A7

TITLE POWER SUPPLY BOARD ASSEMBLY — SHT 5 OF 6

CALICO CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA | CODE IDENT 16067 | PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A7S1		NOT USED ON THIS ASSY			73
A7S2	46206LF	SWITCH, 115V-230V	82389	2-40298	74
					75
A7T1	8544-015-1	TRANSFORMER, POWER	16067	7-10285	76
					77
	6025D	HEATSINK	13103	2-10499	78
	2010C-1	TERMINAL	88245	2-50291	79
	1300C-1	TERMINAL	88245	2-50290	80
					81
	2829-75-4	MOUSETAIL	98159	2-10402	82
	DM-123	MICA WASHER, T0-3	08289	3-30192	83
	8542-208-7	HEATSINK	16067	2-10495	84
					85
					86
					87
					88
					89
					90
					91
					92
					93
					94
					95
	4-40 UNC x 3/8LG	SCREW, PAN HD			96
	4-40 UNC	HEX NUT			97
	#4	LOCKWASHER, INT STAR			98
					99
	6-32 UNC x 7/16 LG	SCREW, PAN HD			100
	6-32 UNC	HEX NUT			101
	#6	LOCKWASHER, INT STAR			102
					103
	8-32 UNC x 5/16LG	SCREW, PAN HD			104
	#8	LOCKWASHER, INT STAR			105
					106
	THERMATE	SILICONE COMPOUND			107
					108

MODEL DSM 44 | CALICO P/N 8544-705 | ASSY R.D. A7

TITLE POWER SUPPLY BOARD ASSEMBLY | SHT 6 OF 6

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA

CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A8	8544-706-1	SWITCH BOARD ASSY	16067		1
	8544-706-7	P.C. BOARD	16067	1-60241	2
					3
					4
A8J1 THRU A8J26		NOT USED			5
A2J27	09-18-5061	CONNECTOR 6-PIN	27264	4-10206	6
A8J28	09-18-5061	CONNECTOR 6-PIN	27264	4-10206	7
					8
					9
A8S1 THRU A8S3		NOT USED			10
A8S4	8544-011-1	SWITCH, 9-STATION	16067	2-40462	11
					12
					13
					14
					15
					16
	J-76115-00 1/8 THK	SPACER	71590		17
					18
					19
					20
					21
					22
					23
					24
					25
					26
					27
					28
					29
					30
					31
					32
					33
					34
					35
					36

MODEL	CALICO P/N	ASSY R.D.
DSM 44	8544-706	A8
TITLE: SWITCH BOARD ASSEMBLY	SHT 4 OF 4	

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A9	8544-707-1	AC REF. BOARD ASSY	16067		1
	8544-707-7	P. C. BOARD	16067	1-60242	2
					3
A9C1	B1A433K	CAPACITOR .043μF 100V	12406	6-10964	4
A9C2	CM05F101J03	CAPACITOR 100pF 500V	81349	6-10027	5
A9C3	32PL2203K-1	CAPACITOR .22μF 100V	12673	6-11009	6
A9C4	32PL2203K-1	CAPACITOR .22μF 100V	12673	6-11009	7
A9C5	32PL2203K-1	CAPACITOR .22μF 100V	12673	6-11009	8
					9
					10
A9CR1	1N4148	DIODE	25403	3-10227	11
A9CR2	1N4148	DIODE	25403	3-10227	12
					13
A9IC1	LM308AH	INTEGRATED CIRCUIT	27014	3-60044	14
A9IC2	CIC 230-3 (ORN DOT)	INTEGRATED CIRCUIT	16067	3-60036	15
					16
A9K1	214-00003	RELAY 1 FORM A	31951	2-45126	17
A9K2	R2204-1	RELAY 1 FORM C	15636	2-45131	18
					19
A9P1 THRU A9P18 NOT USED					20
A9P19	09-52-3121	CONNECTOR, PLUG	27264	4-10207	21
					22
A9R1	EP20	RESISTOR 100K .1% 1/8W	07088	5-80122	23
A9R2	ET34X101	RESISTOR, VAR. 100Ω	30983	5-70184	24
A9R3	PME60T9-11.061K-.1%	RESISTOR 11.061K .1%	03888	5-80205	25
A9R4	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	26
A9R5	RC07GF101J	RESISTOR 100Ω 1/4W 5%	81349	5-10029	27
A9R6	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	28
A9R7	RC07GF333J	RESISTOR 33K 1/4W 5%	81349	5-10088	29
A9R8	RC07GF103J	RESISTOR 10K 1/4W 5%	81349	5-10076	30
					31
					32
					33
					34
					35
					36

MODEL	CALICO P/N	ASSY R.D.
DSM 44	8544-707	A9
TITLE: AC REFERENCE BOARD ASSEMBLY	SHT 4 OF 4	

CALICO | CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA | CODE IDENT 16067 | **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A10	8544-708-1	P.C. BOARD ASSY	16067	--	1
	8544-708-7	P.C. BOARD	16067	1-60243	2
					3
A10C1	CM05F101J03	CAPACITOR 100pF 500V	81349	6-10027	4
A10C2	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	5
A10C3	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	6
A10C4	CM05FD101J03	CAPACITOR 100pF 500V	81349	6-10027	7
A10C5	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	8
A10C6	CM05E300J03	CAPACITOR 30pF 500V	81349	6-10263	9
A10C7	CM05E300J03	CAPACITOR 30pF 500V	81349	6-10263	10
A10C8	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	11
					12
					13
A10CR1	1N4148	DIODE	25403	3-10227	14
A10CR2	1N4148	DIODE	25403	3-10227	15
A10CR3	1N4148	DIODE	25403	3-10227	16
A10CR4	1N4148	DIODE	25403	3-10227	17
A10CR5	1N4148	DIODE	25403	3-10227	18
A10CR6	1N270	DIODE	81349	3-10006	19
A10CR7	1N270	DIODE	81349	3-10006	20
A10CR8	1N4148	DIODE	25403	3-10227	21
					22
A101C1	LM308AH	INTEGRATED CIRCUIT	27014	3-60044	23
A101C2	LM308AH	INTEGRATED CIRCUIT	27014	3-60044	24
A101C3	CIC 235	INTEGRATED CIRCUIT	16067	3-60083	25
A101C4	CIC 235	INTEGRATED CIRCUIT	16067	3-60083	26
A101C5	LM748CN	INTEGRATED CIRCUIT	27014	3-60086	27
					28
					29
A10K1	214-00003	RELAY 1 FORM A	31951	2-45126	30
A10P1 THRU A10P14		NOT USED			31
A10P15	09-52-3121	CONNECTOR, PLUG	27264	4-10207	32
					33
A10Q1	P1087E	FET	15818	3-30225	34
A10Q2	U1899E	FET	15818	3-30196	35
A10Q3	2N5172	TRANSISTOR	56289	3-30219	36

MODEL DSM 44 | CALICO P/N 8544-708 | ASSY R.D. A10

TITLE 4-WIRE AUTO/BI-POLAR RATIO BOARD ASSEMBLY | SHT 4 OF 5

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITE NO
					3
					3
A10R1	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	3
A10R2	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	4
A10R3	EP20	RESISTOR 50K 1/8W .01%	07088	5-80163	4
A10R4	EP20	RESISTOR 50K 1/8W .01%	07088	5-80163	4
A10R5	EP20	RESISTOR 49.975K 1/8W .01%	07088	5-80229	4
A10R6	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	4
A10R7	RN60D24R9F	RESISTOR 24.9Ω 1/4W 1%	81349	5-60458	4
A10R8	EP20	RESISTOR 49.975K 1/8W .01%	07088	5-80229	4
A10R9	ET34X503	RESISTOR VAR. 50K	30983	5-70133	4
A10R10	ET34X500	RESISTOR VAR. 50Ω	30983	5-70129	4
A10R11	OB	RESISTOR 9K .05% 10PPM	07088	5-80350	4
A10R12	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	5
A10R13	ET34X500	RESISTOR VAR. 50Ω	30983	5-70129	5
A10R14	OB	RESISTOR 9K .05% 10PPM	07088	5-80350	5
A10R15	RC07GF472J	RESISTOR 4.7K 1/4W 5%	81349	5-10068	5
A10R16	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	5
A10R17	ET34X503	RESISTOR VAR. 50K	30983	5-70133	5
A10R18	RC07GF240J	RESISTOR 24Ω 1/4W 5%	81349	5-10014	5
A10R19		NOT USED			5
A10R20		NOT USED			5
A10R21	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	5
A10R22	RC07GF243J	RESISTOR 24K 1/4W 5%	81349	5-10085	6
A10R23	RC07GF104J	RESISTOR 100K 1/4W 5%	81349	5-10100	6
					6
					6
					6
A10TP1	2010B-1	TERMINAL	88245	2-50076	6
A10TP2	2010B-1	TERMINAL	88245	2-50076	6
					6
					6
	CBG-2	BOARD GUIDE	06915	2-10596	6
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MODEL DSM 44 — CALICO P/N 8544-708 — ASSY R

TITLE 4-WIRE AUTO/BI-POLAR RATIO BOARD ASSEMBLY — SHT 5 OF 5 — A10

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA — CODE IDENT 16067 — **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A11	8544-709-1	PRINT CARD ASSEMBLY	16067		1
	8544-709-7	P.C. BOARD	16067	1-60244	2
					3
					4
					5
A11C1	TCA-104Z	CAPACITOR .1μF 25V	02799	6-11007	6
A11C2	CK103	CAPACITOR .01μF 50V	71590	6-10094	7
A11CR1	IN270	DIODE	81349	3-10006	8
A11IC1	916C602X5PE	RESISTOR ARRAY	56289	3-60075	9
A11IC2	916C602X5PE	RESISTOR ARRAY	56289	3-60075	10
A11IC3	916C602X5PE	RESISTOR ARRAY	56289	3-60075	11
A11IC4	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	12
A11IC5	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	13
A11IC6	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	14
A11IC7	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	15
A11IC8	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	16
A11IC9	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	17
A11IC10	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	18
A11IC11	SN7408AN	INTEGRATED CIRCUIT	81349	3-60087	19
A11IC12	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	20
A11IC13	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	21
A11IC14	SN7408AN	INTEGRATED CIRCUIT	81349	3-60087	22
A11IC15	SN7404N	INTEGRATED CIRCUIT	81349	3-60002	23
A11IC16	SN74LS174N	INTEGRATED CIRCUIT	81349	3-60088	24
A11IC17	SN74LS174N	INTEGRATED CIRCUIT	81349	3-60088	25
A11IC18	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	26
A11J1 THRU A11J19		NOT USED			27
A11J20	09-52-3123	CONN, 12-PIN	27264	4-10241	28
A11J21	09-52-3123	CONN, 12-PIN	27264	4-10241	29
A11J22	09-52-3123	CONN, 12-PIN	27264	4-10241	30
A11J23	57-40500	CONN, 50-PIN	02660	4-10024	31
A11J24 THRU A11J29		NOT USED			32
A11J30	09-52-3043	CONN, 4-PIN	27264	4-10267	33
					34
A11P1 THRU A11P22		NOT USED			35
A11P23	57-30500	PLUG, CONN, 50-PIN	02660	4-10022	36

MODEL DSM 44 - Option 07 — CALICO P/N 8544-709 — ASSY R.D. A11

TITLE PRINT BOARD ASSEMBLY — SHT 4 OF 5

CALICO — CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA

CODE IDENT 16067

PARTS LIST

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A11R1	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	37
A11R2	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	38
A11R3	RC07GF102J	RESISTOR 1K 1/4W 5%	81349	5-10053	39
A11R4	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	40
A11R5	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	41
					42
					43
					44
					45
					46
					47
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MODEL DSM 44 - Option 07 | CALICO P/N 8544-709 | ASSY R.D. A11

TITLE PRINT BOARD ASSEMBLY | SHT 5 OF 5

CALICO | CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA | CODE IDENT 16067 | **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITEM NO.
A12	8544-710-1	REMOTE CONTROL BD ASSY	16067		1
	8544-710-7	P.C. BOARD	16067	1-60245	2
					3
					4
A12C1	CK102	CAPACITOR .001μF 50V	71590	6-10459	5
A12C2	CK102	CAPACITOR .001μF 50V	71590	6-10459	6
A12C3	CK103	CAPACITOR .01μF 50V	71590	6-10094	7
A12C4	CK102	CAPACITOR .001μF 50V	71590	6-10459	8
A12C5	CK102	CAPACITOR .001μF 50V	71590	6-10459	9
A12C6	CK102	CAPACITOR .001μF 50V	71590	6-10459	10
A12C7	T362B336M010AS	CAPACITOR 33μF 10V	05397	6-10751	11
					12
					13
A12CR1	1N270	DIODE	81349	3-10006	14
A12CR2	1N270	DIODE	81349	3-10006	15
A12CR3	1N270	DIODE	81349	3-10006	16
					17
A12IC1	916C602X5PE	RESISTOR ARRAY	56289	3-60075	18
A12IC2	916C602X5PE	RESISTOR ARRAY	56289	3-60075	19
A12IC3	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	20
A12IC4	SN7475N	INTEGRATED CIRCUIT	81349	3-60004	21
A12IC5	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	22
A12IC6	SN7475N	INTEGRATED CIRCUIT	81349	3-60004	23
A12IC7	SN7475N	INTEGRATED CIRCUIT	81349	3-60004	24
A12IC8	SN7475N	INTEGRATED CIRCUIT	81349	3-60004	25
A12IC9	SN7404N	INTEGRATED CIRCUIT	81349	3-60002	26
A12IC10	SN7402N	INTEGRATED CIRCUIT	81349	3-60001	27
A12IC11	SN7427N	INTEGRATED CIRCUIT	81349	3-60089	28
A12IC12	SN7400N	INTEGRATED CIRCUIT	81349	3-60000	29
A12IC13	NOT USED				30
A12IC14	SN7403N	INTEGRATED CIRCUIT	81349	3-60076	31
A12IC15	SN7403N	INTEGRATED CIRCUIT	81349	3-60076	32
A12IC16	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	33
A12IC17	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	34
A12IC18	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	35
A12IC19	SN7438N	INTEGRATED CIRCUIT	81349	3-60050	36

CALICO | CALIFORNIA INSTRUMENTS CO. SAN DIEGO, CALIFORNIA | CODE IDENT 16067 | **PARTS LIST**

REF. DES.	MFG. NUMBER	DESCRIPTION	CODE IDENT	CALICO STOCK NUMBER	ITE NO
					3
					3
A12J1 THRU A12J23		NOT USED			3
A12J24	5142-009	RIBBON CABLE ASSY	08261	4-10243	4
A12J25	5142-009	RIBBON CABLE ASSY	08261	4-10243	4
A12J26	57-40360	CONN, RECP 36-PIN	02660	4-10208	4
					4
					4
A12P1 THRU A12P25		NOT USED			4
A12P26	57-30360	CONN., PLUG, 36-PIN	02660	4-10209	4
A1Q1	PN2222A	TRANSISTOR	07263	3-30284	4
					4
A12R1	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	4
A12R2	RC07GF102J	RESISTOR 1K 1/4W 5%	81349	5-10053	5
A12R3	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	5
A12R4	RC07GF101J	RESISTOR 100Ω 1/4W 5%	81349	5-10029	5
A12R5	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	5
A12R6	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	5
A12R7	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	5
A12R8	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	5
A12R9	RC07GF100J	RESISTOR 10Ω 1/4W 5%	81349	5-10005	5
A12R10	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	5
A12R11	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	5
A12R12	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	6
A12R13	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	6
A12R14	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	6
A12R15	RC07GF622J	RESISTOR 6.2K 1/4W 5%	81349	5-10071	6
					6
					6
					6
					6
					6
	CA-16S-TSD	SOCKET 16 PIN	52072	2-30057	6
	2000B-1	TERMINAL	88245	2-50099	7
	24 AWG	BUSS WIRE			7
					7

MODEL DSM 44 - Option 08 | CALICO P/N 8544-710 | ASSY R.I

TITLE REMOTE CONTROL BOARD ASSEMBLY | SHT 5 OF 5 | A12

APPENDIX A

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbook H4-1 and its latest supplement. Alphabetical codes have been arbitrarily assigned to suppliers not appearing in the H4 Handbook.

0000A	ElectriCord	Westfield	PA
000AA	OK Machine and Tool Corp.	New York	NY
000AB	Falmat	Harbor City	CA
0000B	Tech. Prod. Sales	Sorrento Valley	CA
0000C	Jackson Bros.	Waddon, Surrey	GB
0000D	Chicago Std. Transformer Co.	Chicago	IL
0000E	Use Code #08289		
0000F	Colvern	Santa Monica	CA
0000G	Use Code #30983		
0000H	Mial of Italy c/o Q.C. Components	Los Angeles	CA
0000I	Use Code #50522		
0000J	Use Code #34333		
0000K	Elma	Schweiz	GE
0000L	Use Code #32293		
0000M	Use Code #16950		
0000N	Use Code #15912		
0000P	Mesa Office Supply	San Diego	CA
0000R	American Handle	Philadelphia	PA
0000S	OPCDA	Edison	NJ
0000T	Use Code #31743		
0000U	Use Code #32293		
0000V	Falmat	Los Angeles	CA
0000W	Miltron Ross Co.	Southampton	PA
0000X	Use Code #52072		
0000Y	Use Code #29990		
0000Z	Timco	Los Angeles	CA
00141	Pic Design Corp.	E. Rockaway	NY
00194	Walsco Electronics Corporation	Los Angeles	CA
00544	Metal-Cal Div., Avery Prod. Corp.	Inglewood	CA
00656	Aerovox Corporation	New Bedford	MA
00779	AMP, Inc.	Harrisburg	PA
00853	Sangamo Electric Company	Pickens	SC
00866	Goe Eng. Co., Inc.	City of Industry	CA
01121	Allen-Bradley Company	Milwaukee	WI
01179	Ajax Magnethermic Corp.	NE Warren	OH
01255	Litton Industries, Inc.	Beverly Hills	CA
01281	T R W Semiconductors, Inc.	Lawndale	CA
*01295	Texas Instruments, Inc.	Dallas	TX
02111	Spectrol Electronics	City of Industry	CA
02114	Ferroxcube Corp.	Saugerties	NY
02335	Fairchild Controls Corp.	Hicksville, LI	NY
02660	Amphenol Corporation	Broadview	IL
02799	Use Code #72136		
03507	General Electric Company	Syracuse	NY
03508	General Electric Company	Syracuse	NY
03516	General Electric Company	Somersworth	NH
03797	Eldema Corporation	Compton	CA
03888	Pyrofilm Resistor Co., Inc.	Cedar Knolls	NJ
03911	Clairex Corporation	New York	NY
04009	Arrow-Hart and Hegeman Elec. Co.	Hartford	CT
04062	Use Code #72136		
04713	Motorola Semiconductor Prod., Inc.	Phoenix	AZ
04963	3-M	St. Paul	MN
05236	Jonathan Mfg. Co.	Fullerton	CA
05276	Pomona Electronics Co., Inc.	Pomona	CA
05347	Ultronixs	Grand Junction	CO
05397	Kemet, Union Carbide Corp.	Cleveland	OH
05820	Wakefield Engineering, Inc.	Wakefield	MA
06046	Dixson Meter	Grand Junction	CO
06184	Conelco Components	San Bernadino	CA
06223	Kooltronic Fan Company	Princeton	NJ
06229	Electrovert, Incorporated	Mt. Vernon	NY
06383	Panduit Corp.	Tinley Park	IL
06514	Stantron, Wyco Metal Products	N. Hollywood	CA
06540	Amathom Elect. Hardward	New Rochelle	NY
06682	Magnetic Shield Div.	Chicago	IL
06776	Robinson, Nugent, Inc.	New Albany	IN
06915	Richco Plastics, Co.	Chicago	IL
07088	Kelvin Electric Company	Van Nuys	CA
07115	Use Code #14674		
07256	Silicon Transistor Corp.	Garden City	NY
07263	Fairchild Camera and Instr. Corp.	Mt. View	CA
07387	Birtcher Corporation	Los Angeles	CA
07556	Unitrack Calabro Plastics	Upper Darby	PA
07633	Epoxy Prod. Co. Div. of Allied Prod. Corp.	New Haven	CT
07713	Sperry Rand Corporation	Norwalk	CT
07716	I R C Incorporated	Burrington	IA
07910	Continental Devices	Hawthorne	CA
08065	Accurate Rubber and Plastics Co.	San Diego	CA
08261	Spectra Strip	Garden Grove	CA
08289	Blinn-Delbert Co., Inc.	Pomona	CA
08594	Eimac Div. of Varian Associates	Salt Lake	UT
08718	Use Code #71468		
08730	Vemaline Products Co.	Franklin Lakes	NJ
09026	Babcock Electronics Corp.	Costa Mesa	CA
09145	Atohm, Technical Industries, Inc.	Burbank	CA
09353	C and K Components, Inc.	Newton	MA
11432	Diamond Metal Sales	Gardena	CA
11815	Cherry Rivet Div., Townsend Co.	Santa Ana	CA
12020	Ovenaire, Incorporated	Charlottesville	VA
12143	Bendix Corporation	Santa Ana	CA
12405	Hysol Corporation	El Monte	CA
12406	Elpac, Incorporated	Fullerton	CA
12463	Omtronics Mfg., Incorporated	Omaha	NE
12673	Wesco Electrical Co.	Greenfield	MA
12697	Clarostat Mfg. Co., Incorporated	Dover	NH
13103	Thermalloy Company	Dallas	TX
13454	Texas Crystals	River Grove	IL
13571	Electronic Research	Overland Park	KS
13919	Burr-Brown Research Corp.	Tucson	AS
14099	Semtech Corporation	Newbury Park	CA
14193	Cal-R Inc.	Santa Monica	CA
14604	Elmwood Sensors Inc.	Cranston	RI
14655	Cornell-Dubilier Elect. Corp.	Newark	NJ
14674	Corning Glass Works	Corning	NY
14726	Hollingsworth Co.	Phoenixville	PA
14752	Electro Cube, Incorporated	San Gabriel	CA
14907	Cramer Div. of Conrac	Old Saybrook	CT
15112	Electra Scientific Corporation	Fullerton	CA
15636	Elec-trol	Northridge	CA
15801	Fenwall Electronics	Framingham	MA
15818	Amelco Teledyne, Incorporated	Mt. View	CA
15909	Use Code #17870		
15912	Analey	Los Angeles	CA
16067	California Instruments Company	San Diego	CA
16758	Delco Radio Div., General Motors	Kokomo	IN
16795	Bristol Electronics Inc.	Bedford	MA
16902	Simpson Instruments, Inc.	Escondido	CA
16950	Precision Dynamics Corp.	Burbank	CA
16956	Dennison	Framingham	MS
17745	Angstrohm Precision, Inc.	Van Nuys	CA
17838	Mektron, California General, Inc.	Chula Vista,	CA
17856	Siliconix	Santa Clara	CA
17870	Daven Div., Thomas A. Edison	Manchester	NH
18076	Umpco	City of Industry	CA
18121	Wilshire Foam Products, Inc.	Gardena	CA
18178	Vactec Inc.	Maryland Heights	MO
18324	Signatics	Sunnyvale	CA
18612	Vishay Instruments Inc.	Malvern	PA
18677	Scambe Mfg. Co.	Monterey Park	CA
18702	Ducommun Metals and Supply Co.	Los Angeles	CA
18722	R C A	Mountaintop	PA
19080	The Robinson Company	Hawthorne	CA
19781	Potter Company	Sun Valley	CA
20857	South Bay Cable Corp.	Gardena	CA
21270	Behr-Manning	Watervliet	NY
21604	Buckeye Stamping Company	Columbus	OH
22045	Jordan Elect.	Van Nuys	CA
22599	Elastic Stop Nut Corporation	Van Nuys	CA
23059	Deccofelt Products Company	Glendora	CA
23050	Product Components Corp.	Hastings-on-Hudson	NY
23095	Astec Electronics In.	Anaheim	CA
23783	British Radio Electric Ltd.	Washington	DC
23936	Pamotor, Incorporated	San Francisco	CA
24011	E C C	Burlington	MA
24655	General Radio	Concord	MA
24796	Parelco Inc.	Paramount	CA
24931	Specialty Connector Co., Inc.	Indianapolis	IN
25403	Amperex (Diodes)	Slaterville	RI
25684	Victoreen Instrument Co., Inc.	Oak Lawn	IL
25706	Daburn Electronics and Cable Corp.	New York	NY
*01963	Cherry Electronical Prod. Corp.	Waukegan	IL

26528	Lamcor Incorporated	Anaheim	CA
26533	Use Code #98376		
26806	American Zettler Inc.	Costa Mesa	CA
27014	National Semi-Conductor Corp.	Santa Clara	CA
27191	Cutler-Hammer, Inc.	Milwaukee	WI
27264	Molex	Downers Grove	IL
27556	IMB Electronic Products	Santa Fe Springs	CA
27683	Varo, Incorporated	St. Garland	TX
27832	Hughes Aircraft	Newport Beach	CA
28480	Hewlett-Packard Co.	Palo Alto	CA
*28520	Heyman Mfg. Company (Heyco)	Kenilworth	NJ
30086	I-T-E Circuit Breaker Co.	Philadelphia	PA
30817	Instrument Specialties Co.	Little Falls	NJ
30897	Dorann Co.	Sylmar	CA
30983	Electra/Midland (Mepco/Electra)	San Diego	CA
31743	Elpower	Santa Ana	CA
31951	Tririge Inc.	Pittsburgh	PA
32293	Intersil	Cupertino	CA
34333	Silicon General	Westminister	CA
34649	Intel Corp.	Santa Clara	CA
35929	Constanta	Quebec	CN
42190	Muter Company	Chicago	IL
44655	Ohmite Manufacturing Company	Skokie	IL
45722	Parker-Kalon	Clifton	NJ
46384	Penn. Eng. and Mfg. Corp.	Doylestown	PA
49956	Raytheon Co.	Lexington	MA
50522	Monsanto, Electronic Special Products	Cupertino	CA
50558	Electronic Concepts Inc.	Eatontown	NJ
51705	ICO/Rally	Palo Alto	CA
52072	Circuit Assembly Corp.	Costa Mesa	CA
53209	W. H. Brady Co.	Milwaukee	WI
56289	Sprague Electric Company	North Adams	MA
57771	Stimson	Bayport	NY
58474	Superior Electric Company	Bristol	CT
59730	Thomas and Betts Company	Elizabeth	NJ
60741	Triplett Electrical Instrument Co.	Bluffton	OH
63743	Ward Leonard Electric Co.	Mt. Vernon	NY
70318	Allmetal Screw Prod. Co.	Garden City	NY
70903	Belden Manufacturing Co.	Chicago	IL
71002	Birnbach Radio Company, Inc.	New York	NY
71218	Bud Radio	Willoughby	OH
71279	Cambridge Thermionic Corp.	Cambridge	MA
71400	Bussman Mfg. Div. McGraw-Edison Co.	St. Louis	MO
71450	CTS Corporation	Elkhart	IN
71468	ITT Cannon Electric Inc.	Los Angeles	CA
71590	Centralab Div. Globe-Union, Inc.	Milwaukee	WI
71707	Coto-Coil	Providence	RI
71744	Chicago Miniature Lampworks	Chicago	IL
71785	Cinch Manufacturing Company	Chicago	IL
72136	Elmenco (Electro Motive)	Willimantic	CT
72259	Nytronics, Incorporated	Pelham Manor	NY
72619	Dialight Corporation	Brooklyn	NY
72699	General Instruments	Newark	NJ
72982	Erie Technological Products, Inc.	Erie	PA
73138	Beckman Instruments, Inc.	Fullerton	CA
73445	Amperex (Capacitors)	Long Island	NY
73559	Carling Electric, Inc.	West Hartford	CT
73734	Federal Screw Products, Inc.	Chicago	IL
73899	J F D Electronics Company	Brooklyn	NY
73949	Guardian Electric Mfg. Co.	Chicago	IL
73957	Groov-Pin Corporation	Ridgefield	NJ
74193	Heinemann Electric Company	Trenton	NJ
74276	Signalite, Incorporated	Neptune	NJ
74542	Hoyt Electrical Instrument Works	Penacook	NH
74545	Harvey Hubbel, Inc.	Bridgeport	CT
74970	E. F. Johnson Company	Waseca	MN
75382	Kulka Electric Corporation	Mt. Vernon	NY
75915	Littlefuse, Incorporated	Des Plaines	IL
75987	Use Code #95987		
76055	Mallory Controls	Frankfort	IN
76348	Miller Products Company	New York	NY
76385	Minor Rubber Co.	Bloomfield	NJ
76493	J. W. Miller Company	Los Angeles	CA
76854	Oak Manufacturing Company	Crystal Lake	IL
77342	Potter and Brumfield Div., Amer. Machine and Foundry Company	E. Princeton	IN
77638	General Instruments	Brooklyn	NY
77969	Rubber Craft Corp. of California	Torrance	CA
78189	Shakeproof Div., Illoms Tool Works	Chicago	IL
78299	Struthers-Dunn, Incorporated	Pitman	NJ
78488	Stackpole Carbon Company	St. Marys	PA
78526	Stanwyck Winding Company, Inc.	Newburgh	NY
78553	Tinnerman Products, Inc.	Cleveland	OH
78947	Ucinite Company	Newtonville	MA
79130	Johns-Manville Products Corp.	Chicago	IL
79727	Continental-Wirt Electronics Corp.	Warminister	PA
79963	Zierick Mfg. Corporation	New Rochelle	NY
80031	Mepco/Electra	Morristown	NJ
80112	G. C. Electronics Company	Los Angeles	CA
80223	United Transformer Co.	New York	NY
80294	Bourns, Incorporated	Riverside	CA
80368	Sylvania Electric Products, Inc.	New York	NY
80583	Hammarlund Mfg. Co.	Red Bank	NJ
81073	Grayhill, Incorporated	La Grange	IL
81095	Triad Transformer Corp.	Venice	CA
81312	Winchester Electronics	Oakville	CT
81349	Military Spec., Standardization Division Directorate of Logistic Services DSA		
82104	Standard Grigsby	Aurora	IL
82389	Switchcraft, Incorporated	Chicago	IL
82877	Rotron Manufacturing Co., Inc.	Woodstock	NY
82893	Vector Electronics Inc.	Sylmar	CA
83058	Car Fastener Company	Cambridge	MA
83125	Nytronics Inc. Cap. Division	Darlington	SC
83324	Rosan, Incorporated	Newport Beach	CA
83330	Herman H. Smith, Inc.	Brooklyn	NY
83594	Burroughs Corporation	Plainfield	NJ
83701	Electronic Devices, Incorporated	Yonkers	NY
83781	Natl. Electronics	Geneva	IL
83827	Resistors Inc.	Chicago	IL
84171	Arco Electronics, Inc.	Great Neck	NY
86684	R C A	Harrison	NJ
86928	Seastrom Mfg. Co.	Glendale	CA
87034	Marco-Oak Industries	Anaheim	CA
88026	Use Code #27191		
88245	Useco Div., Litton Industries	Van Nuys	CA
89536	Fluke	Seattle	WA
90030	USM Corp.	Beverly	MA
90201	Mallory Capacitor Company	Indianapolis	IN
91459	Alcon Metal Prod. Inc.	Chicago	IL
91506	Augat	Attlebord	MA
91637	Dale Electronics, Inc.	Columbus	NE
91662	Elco Corporation	Willow Grove	PA
91812	Janco Corporation	Burbank	CA
91833	Keystone Electronics Corp.	New York	NY
91929	Micro Switch Div., Honeywell, Inc.	Freeport	IL
92194	Alpha Wire Corporation	Elizabeth	NJ
92219	Waldom Electronics, Inc.	Chicago	IL
93332	Sylvania Electric Products, Inc.	Woburn	MA
94222	Southco, Incorporated	Lester	PA
95146	Alco Electronics Products	Lawrence	MA
95303	R C A	Cincinnati	OH
95348	Gordos Corp.	Bloomfield	NJ
95416	Use Code #95146		
95987	Weckesser Company, Inc.	Chicago	IL
96682	Genisco, Incorporated	Compton	CA
96733	San Fernando Electric Mfg. Co.	San Fernando	CA
97525	Electronic Engineering Co.	Santa Ana	CA
97918	Linemaster Switch Corp.	Woodstock	CT
97954	U.S. Components, Incorporated	Bronx	NY
98159	Rubber Teck, Incorporated	Gardena	CA
98278	Microdot, Incorporated (Lerco)	S. Pasadena	CA
98291	Sealecto Corp	Mamaroneck	NY
98376	Zero Mfg. Co. (West)	Burbank	CA
98978	IERC	Burbank	CA
99028	Globe	Gardena	CA
99378	Atlee Corp.	Woburn	MA
99392	STM Corporation	Oakland	CA
99515	Marshall Industries	Monrovia	CA
99517	Vacco Industries	El Monte	CA
99742	Permacel Div., Johnson and Johnson	New Brunswick	NJ
99743	I M C	Maywood	CA
99800	Delevan Electronics Corporation	Aurora	NY
*29990	American Technical Ceramics	Huntington Station	NY

ONE YEAR WARRANTY

CALIFORNIA INSTRUMENTS COMPANY a division of AIKEN INDUSTRIES INC. warrants each instrument manufactured by them to be free from defects in material and workmanship for a period of one year from the date of shipment to the original purchaser. Excepted from this warranty are tubes, fuses, and batteries which carry the warranty of their original manufacturer where applicable. CALIFORNIA INSTRUMENTS COMPANY will service, replace, or adjust any defective part or parts, free of charge, when the instrument is returned to the Company freight prepaid, and when examination reveals that the fault has not occurred because of misuse or abnormal conditions of operation. Equipment repaired beyond the effective date of warranty or when abnormal usage has occurred will be charged at applicable rates. CALIFORNIA INSTRUMENTS COMPANY will submit an estimate for such charges before commencing repair if so requested.

PROCEDURE FOR SERVICE

If a fault develops, notify CALIFORNIA INSTRUMENTS COMPANY or its local representative, giving full details of the difficulty, and including the model number and serial number. On receipt of this information, service data or shipping instructions will be furnished. If shipment is indicated, forward the instrument, freight prepaid, to the authorized repair station indicated in the instruction. If requested, an estimate of the charges will be made before the work begins, provided the instrument is not covered by the warranty.

DAMAGE IN TRANSIT

The instrument should be tested as soon as it is received. If it fails to operate properly, or is damaged in any way, a claim should be filed with the carrier. A full report of the damage should be obtained by the claim agent, and this report should be forwarded to us. CALIFORNIA INSTRUMENTS COMPANY will advise the disposition to be made of the equipment and arrange for repair or replacement. Please include model number and serial number when referring to the instrument.

MP MASTER
MA28056